SIGNAL

January 1961

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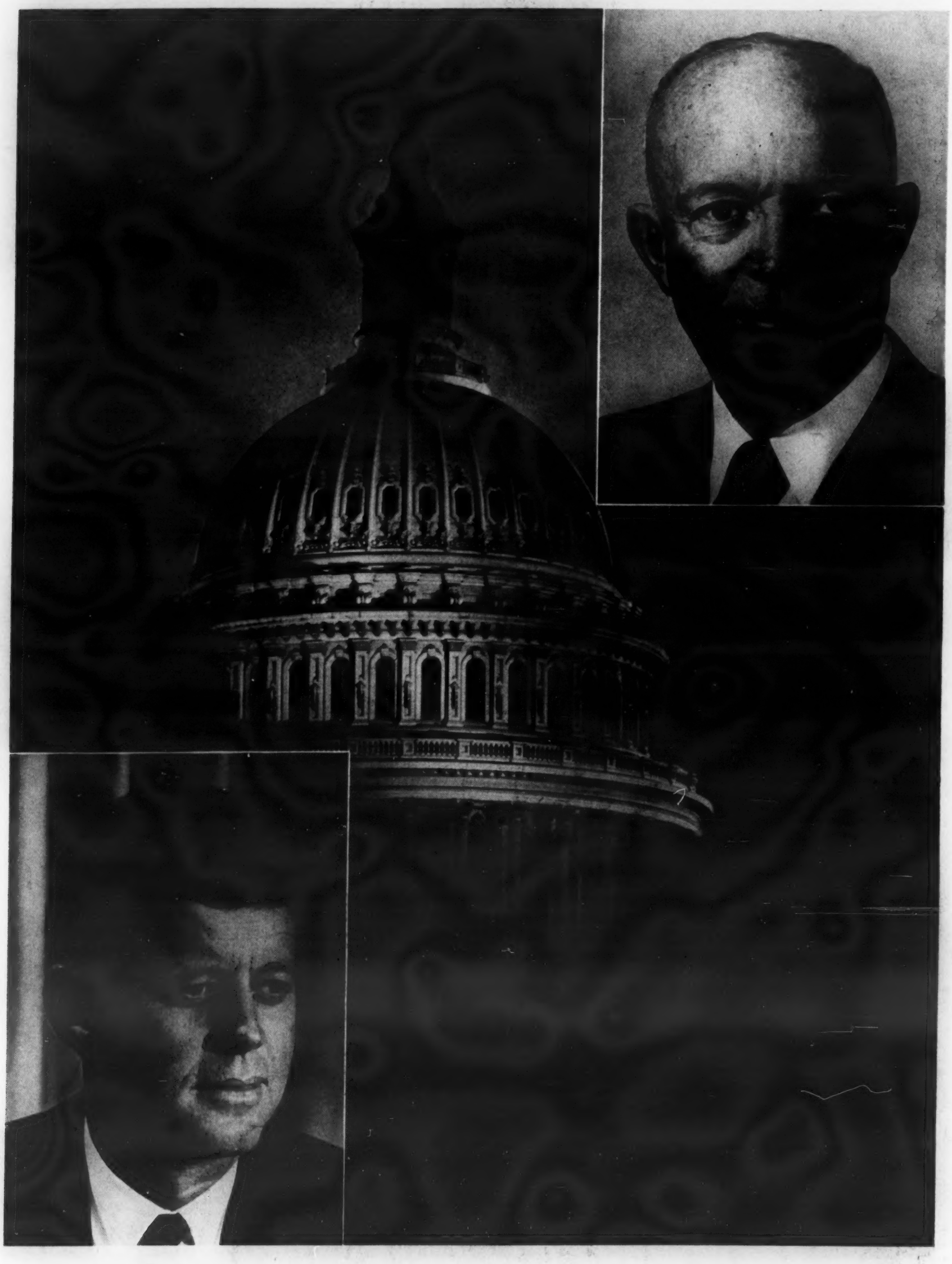

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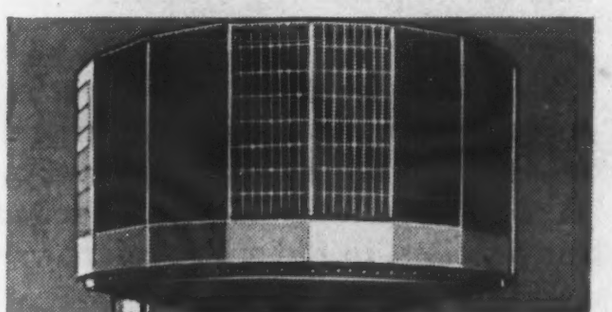

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Communications-Electronics-Photography

Journal of the Armed Forces Communications and Electronics Association

VOLUME XV JANUARY 1961 NUMBER 5

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1624 Eye Street, NW
Washington 6, D. C.
Phone: EXecutive 3-3033

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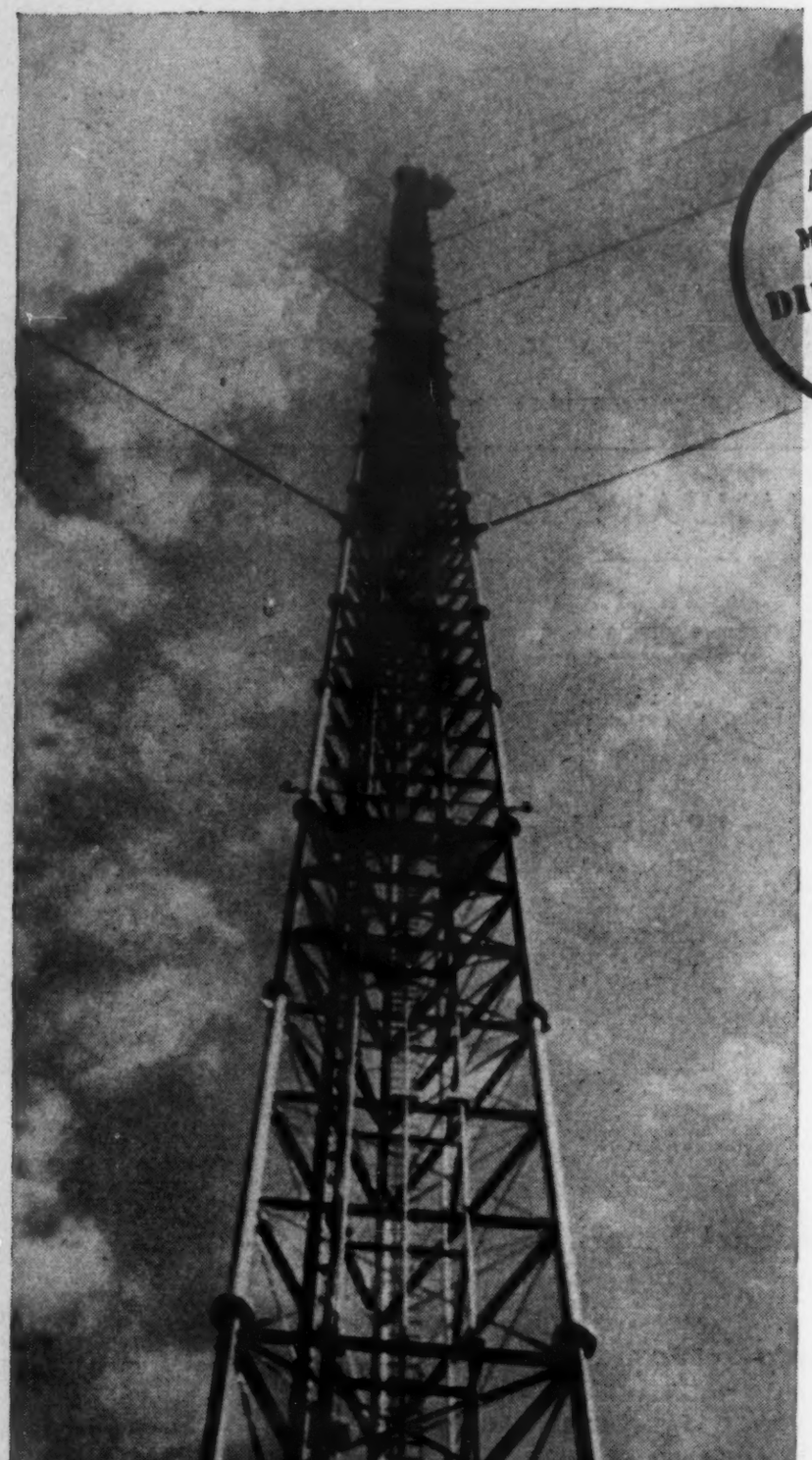

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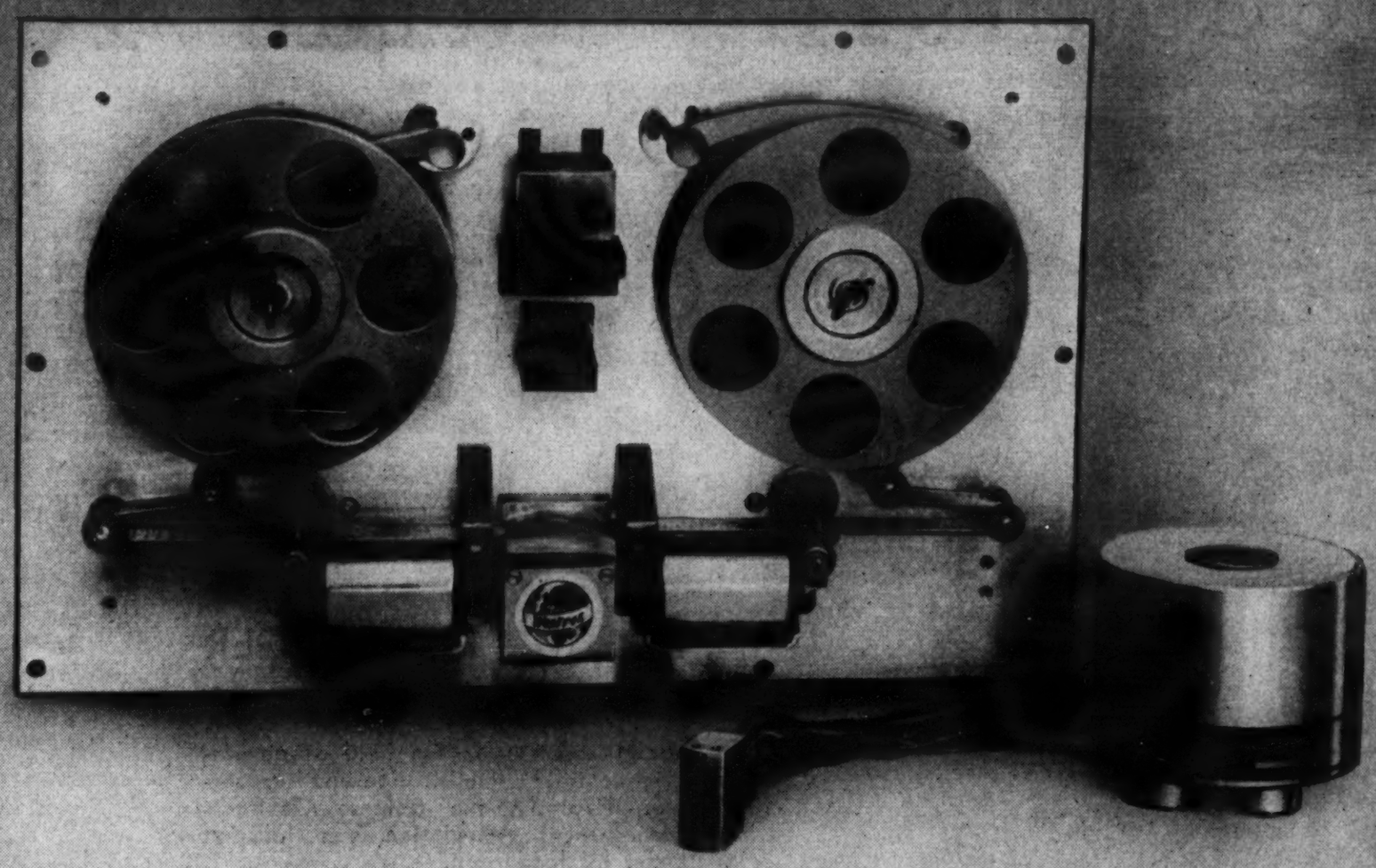

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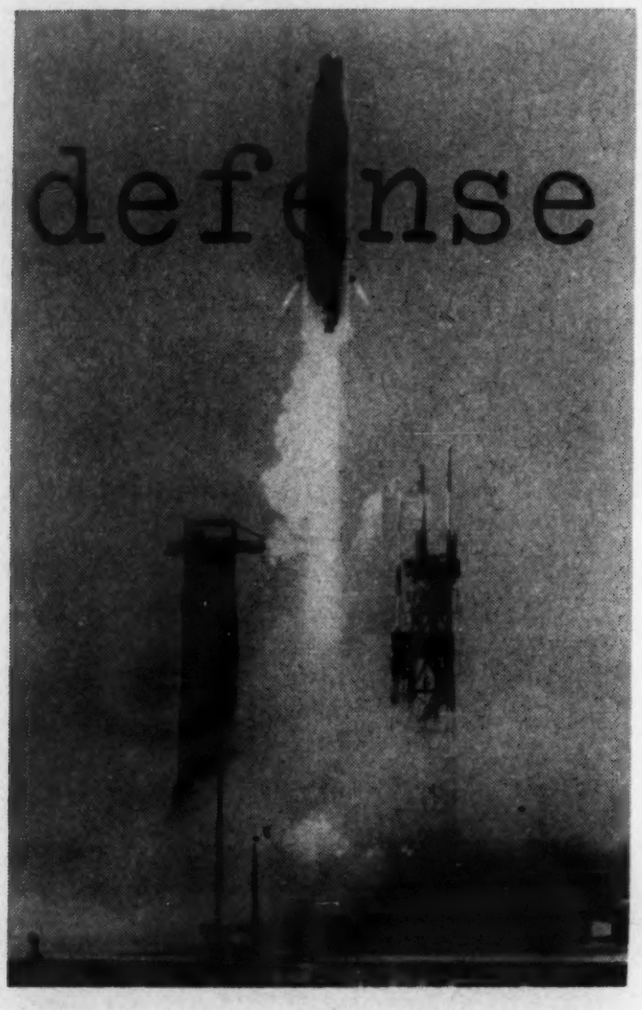
administrative and accounting guide for defense contracts



by PAUL M. TRUEGER

Mr. Trueger is a C.P.A. and an acknowledged authority in the field of government contract administration and accounting. Recently, the Defense Contracts Management Association was founded under his leadership.

WHEN ASKED TO write an article for SIGNAL on defense contract administration and accounting, the major problem was how to accord reasonable coverage to the many important aspects of this matter, within the available space. There are many characteristics of defense contracts that differ in whole or in part from industrial business relations. Some of the subjects that might well be covered in this area include: the various categories of Government representatives that a contractor meets, their roles and their relationships; unusual regulations regarding debarred, ineligible and suspended bidders, special provisions for small business concerns, aid to labor surplus areas and depressed industries, etc.; types of defense contracts and the many contractual clauses which they contain; ramifications involved when the Government furnishes equipment, tools or material to the contractors; various financing methods employed by the Government, including progress payments, advance payments and guaranteed loans; numerous requirements, most of them policed by various Government representatives in respect of contractors' management and accounting policies and practices; the broad and complicated field of contract cost principles, involving Governmental concepts as to which costs are "allowable" and which are "unallowable"; problems of changes to Government contracts, including the processing of price adjustments, related disputes, and procedures before the Armed Services Board of Contract Appeals; a large area with its own special complications involving circumstances where defense contracts are terminated; renegotiation. This imposing list, and incomplete at that, would well suggest the expression: "I could write a book." As a matter of fact, as many of the readers know, I have written a book with the same title as this article. Now in its third edition, it contains close to six hundred pages devoted to doing business with the Government.

In my extensive associations with defense contractors, I find that the subject of contract cost principles is discussed at least as much as any other in this field. In view of this interest, a portion of this article will be devoted to a discussion of two of the more controversial cost categories involved.

Allowability of advertising expenses has long been one of the most difficult and controversial problems in pricing and repricing of defense contracts. Despite the numerous regulations and interpretations issued by the Government, starting far back with Treasury Decision 5000 (1940), and coming right up to the very present cost principles issued in November 1959, we are still without a consistent and clear cut exposition

on this subject. Armed Services Procurement Regulation (ASPR) 15-205.1 sets forth the current Defense Department position on advertising costs. The significant portion in terms of dollar effect on defense contractors describes the following advertising costs as allowable:

> "Advertising in trade and technical journals, provided such advertising does not offer specific products or services for sale but is placed in journals which are available for dissemination of technical information within the contractor's industry:"

The two major problems involved in advertising are (1) the nature of the advertising medium, and (2) the nature of the advertising copy. Each of these problems has its own numerous and complex ramifications. In the instance of the first problem, we have yet to see a clear cut definition of what constitutes a trade and technical journal. From time to time, proposals have been submitted for the issuance and maintenance of a list of publications which would be accepted by Government contracting authorities as trade and technical journals. These proposals have not been adopted because of the stupendous job involved in establishing such a list and maintaining it on a current basis during these days where such publications flourish in great numbers. This idea has also been rejected because of the numerous problems that would arise where publishers of journals not qualified as trade and technical would submit vehement protests, including political pressures and even possible legal actions. As an illustration of difficulties involved in this area, the Assistant Secretary of the Air Force recently advised a member of Congress that *Air Force* Magazine, official journal of the Air Force Association, was not a trade or technical journal within the context of ASPR. Shortly afterwards, the Assistant Secretary wrote another letter to the Congressman stating that his classification of *Air Force* Magazine was inaccurate. He noted ". . . that there has been no categorical classifications of any of the scores of magazines which may, under certain circumstances, be considered a trade or technical journal. Rather, the question of whether or not a journal may be considered a trade or technical journal is susceptible to various interpretations. Nor is there a commonly accepted precise definition of what constitutes a trade or technical journal."

Substantial difficulties are also inherent in the prohibition of advertising copy which offers specific products or services for sale. It has generally become accepted that, for example, a producer of electrical-electronic products, operating under various defense contracts, could not expect reimbursement for costs of advertising radios and television sets offered to the public. Somewhat less clear is the area of products or services sold solely or substantially to the Government directly, or indirectly as in the instance of a subcontract to a defense prime contractor.

Defense Department procurement officials are far from unanimous in this area. Some months ago the permanent committee established for the promulgation and revision of ASPR appointed a special subcommittee to establish a set of ground rules and interpretations through which defense procurement and audit representatives could arrive at and maintain a consistent position on the allowability of advertising. Our latest information indicates that this subcommittee has been unable to arrive at a cost interpretation acceptable to all powers that be.

Advertising Expense

In the absence of authoritative, definitive interpretations, defense contractors are placed in the position of negotiating individually with various Government procurement and audit representatives. In my opinion, defense contractors whose advertising expenditures are substantial, should seek reimbursement for every dollar of advertising expense which has not been declared unallowable in a clear cut manner by a regulation. With regard to whether a publication falls within the category of a trade and technical journal, it would appear that the burden of proof is upon the Government. Again, as to the advertising copy, we all know that industrial firms do not insert ads which state "Compliments of a Friend," or the like. No matter how "institutional" in nature the advertising may be, it is hardly possible for the ad not to give some indication of the capabilities or the interests of that company. And so, with this area being as nebulous as it is, we can only reiterate that a contractor's interests dictate the claiming of and fighting for all advertising costs other than those which very clearly benefit only commercial sales.

The Defense Department cost principles which preceded the November 1959 revision provided that the cost of "research and development specifically applicable to the supplies or services covered by the contract" was allowable. The predecessor cost principles cited as unallowable: "general research, unless specifically provided for elsewhere in the contract." In comparison, the new cost principles appear to be substantially more liberal. The costs of contractors' independent research, are allowable, "provided they are allocated to all work of the contractor." Contractors' independent development costs "are allowable to the extent that such development is related to product lines for which the Government has contracts, provided the costs are reasonable in amount and are allocated as indirect costs to all work of the contractor on such product lines. In cases where a contractor's normal course of business does not involve production work, the cost of independent development is allowable to the extent that such development is related and allocated as an indirect cost to the field of effort of Government research and development contracts."

These provisions appear quite reasonable, especially when compared to the restrictive predecessor regulations. However, there is a major "hooker" which, depending on the manner in which the regulation is administered, may serve to influence industry's recovery of costs in this area. This "hooker" (ASPR 15-205.35 (h)) suggests that if the contractor were to share the costs of research and development programs with the Government, the program might be accomplished more efficiently. To this end, ASPR suggests the desirability of the Government bearing "less than an allocable share of the total cost of the program." Defense procurement authorities are directed to review this area and seek agreement with the contractor on one of three alternatives. The Government will seek to accept (1) the allocable costs of specific projects, (2) an allocable portion of a maximum dollar limitation of costs, or (3) the allocable share of a percentage of the contractor's planned research and development program.

In my book, written early in 1960, I noted that research and development costs represent "a very difficult area and it is doubtful that the commentary in the November revision of ASPR Section XV will achieve clarity or assure consistent treatment." This forecast materialized very shortly after the new cost principles were

(*Continued on page* 43)

EDITOR'S NOTE

Recognizing the necessity of controlling radio frequency interference (RFI), AFCEA has been interested in supporting means which further this end. It is our conviction that any assistance which can be given to further the Federal Communications Commission and its field division representatives, to aid them in their work to successfully minimize interference, would be highly commendable. Today there are thirty-four local Cooperative Interference Committees which perform a most valuable service in locating sources of interference.

AFCEA members have been active in the CIC Program and we hope that more members will participate in these committees. Ray Meyers and Al Parker, AFCEA members, were instrumental in getting the first CIC organized in California. Another AFCEA member, George S. Turner has urged that our Association Chapters seriously consider supporting the functions of a committee in their locale. The following article by Mr. Turner, Chief, Field Engineering and Monitoring Bureau, Federal Communications Commission, explains how the various CIC's assist the FCC and perform a national service. In a subsequent article, Mr. Meyers, Chairman of the Southern California CIC, will discuss ways to organize a committee. Also, he will describe typical problems which have arisen and how these problems on interference have been solved.

The April 1957 issue of SIGNAL contains guide lines on individual and collective CIC voluntary participation.

W. J. Baird

AN INSURANCE POLICY COVERING RFI

by GEORGE S. TURNER

Chief, Field Engineering & Monitoring Bureau
Federal Communications Commission

THE ALPHABETICAL ABBREVIATION RFI—for Radio Frequency Interference—is well known to both Government and Industry users of the crowded radio spectrum. While the problem of RFI is becoming increasingly serious, fortunately something can and is being done about it. For one approach, equipment specifications designed to reduce unwanted radiations are continually under review and extensive programs are underway for advance prediction and later identification of interference sources and levels, considering the total environment of electronic installations. "Spectrum signatures" of electronic equipments are being determined and cataloged for use in electronic computers for prediction and subsequent identification of interfering radiations. In the international picture, the International Special Committee on Radio Interference (CISPR) and the International Radio Consultative Committee (CCIR) are studying various aspects of RFI leading to improved techniques of detection, identification, measurement and prevention. But in spite of all these worthwhile studies and actions, a person or organization experiencing RFI is in need of an immediate remedy. As in all human endeavor, organized groups are more effective in solving RFI than are individuals working alone. The following discussion relates to one very important organization—the Cooperative Interference Committee (CIC)—which may be likened to an insurance policy covering anyone in the radio communications industry against the RFI hazard. This certainly includes AFCEA members who, therefore, should be interested in participating and in accruing the benefits.

CIC Organization

The Cooperative Interference Committee is an industry-wide composite group representing all classes of communication services within a particular geographical region. Generally represented also are manufacturers of electronic equipment, power companies, county and municipal governments and specific communication organizations, such that someone on the committee is generally in a position to take or suggest the proper corrective action to solve an interference case.

Much has been learned in the six years since the start of the CIC program. One of the most important facts observed is that a clear separation of responsibility should exist between the CIC's and the Television Interference Committees (TVI). Over 500 of the latter, comprising mainly radio amateur operators, are doing excellent work to reduce interference to television reception by the public. They in turn do not handle the type of communications RFI case with which the CIC's can cope.

Another point learned is that a committee does not have to hold regular meetings or be constantly in-

volved in tracking down radio interference to accomplish worthwhile results. The directory listing of names, addresses, telephone numbers and company or agency affiliation published by each CIC is an equally important means of holding a group together. If the directory is kept current, any member needing assistance or advice in an RFI problem affecting his company or organization can usually find the right person with the knowledge of what is causing the interference. Other CIC's may choose to hold regular meetings and be relatively more active, even to participating in domestic and international studies relating to interference and commenting on Federal Communications Commission proposed rule making. The choice as to the amount of extra activity rests entirely with the committee. The point is, however, that the so-called "stand-by" committee with an up-to-date directory is an effective CIC organization even if it only handles a small number of RFI problems per year. It provides an insurance policy which can at any time prove of real value to one or more members and to the community. Looking ahead to possible future increased radio spectrum congestion and to the communications satellite era, the added insurance of a CIC organization for quick personal and company reference in an RFI case seems more and more important. Thus rather than wait for the government engineer, who may be tied up on priority work elsewhere, the local CIC organization can make an immediate check (frequently by telephone) by having appropriate members of the operating staffs compare operating schedules, frequencies activated, and on-the-air observations. Off and on checks can go far in pinpointing a defective transmitter; similarly, when the source of the interference is in doubt, over-the-air observations by others should be helpful in identifying the "RFI signature" of the interference and, in verifying whether the interference is local or distant. Experience during the past six-year period has demonstrated that a well organized and integrated CIC is thus able to make a quick investigation and in many instances solve the interference through the use of its own facilities and "self help" action.

In those cases which do not lend themselves to local and reasonably prompt detection and treatment, the FCC is always ready and anxious to step in. However, as has already been indicated, if the personal services of an FCC engineer are required, some delay is usually inevitable. Here again the CIC organization can be effective. In a case of continuing interference, other than local, rather than call the nearest FCC district office for a field investigation, it would no doubt save time to place the call to the nearest FCC monitoring station—the CIC Directory would contain a listing with telephone numbers of FCC offices and stations. The call should be made by a member of the Committee who has personal knowledge of the nature, frequency and related characteristics of the interfering signal. By notifying the FCC monitoring station at a time when the interference is active, the monitoring station should be able to check the signal over the air and if needed get aid in solving the problem from the entire FCC network.

As the number of licensed radio stations and industrial, scientific and medical RF units continues to increase each year, so do the interference complaints received by the Federal Communications Commission. The FCC does not shirk its responsibility to resolve interference between its licensees. Field engineers of the FCC Field Engineering and Monitoring Bureau at radio monitoring stations and in mobile investigative units are constantly at work digging out the facts needed to solve interference cases. But the FCC Field staff is not now and never will be large enough to do the job alone. "Self-help" by radio user groups is expected. It is, therefore, natural that the CIC idea was born to obtain the benefit of group action over individual effort. AFCEA members are interested in the CIC program as their association membership represents a true cross section of the communications industry to which RFI is becoming more of a serious problem as the art advances.

CIC Idea—Past and Present

Two AFCEA Southern California Chapter members, Ray Meyers and Al Parker, with the sponsorship and help of Bernard Linden, FCC Engineer in Charge, Los Angeles, developed the CIC idea and formed the first committee. Ray is the present chairman of the Southern California CIC. The idea spread with the help of the originators and other FCC Engineers in Charge. There are now 34 active committees throughout the country, including Alaska, Hawaii and Puerto Rico. AFCEA members are the chairmen of committees in Honolulu (Robert Britton); St. Louis, Missouri (H. G. Wise) and San Juan, Puerto Rico (Jorge Velez). AFCEA is, of course, not the only national organization helping with the CIC program. The Institute of Radio Engineers and the Joint Technical Advisory Committee groups and others have publicized it and worked for its success.

CIC Idea—Future

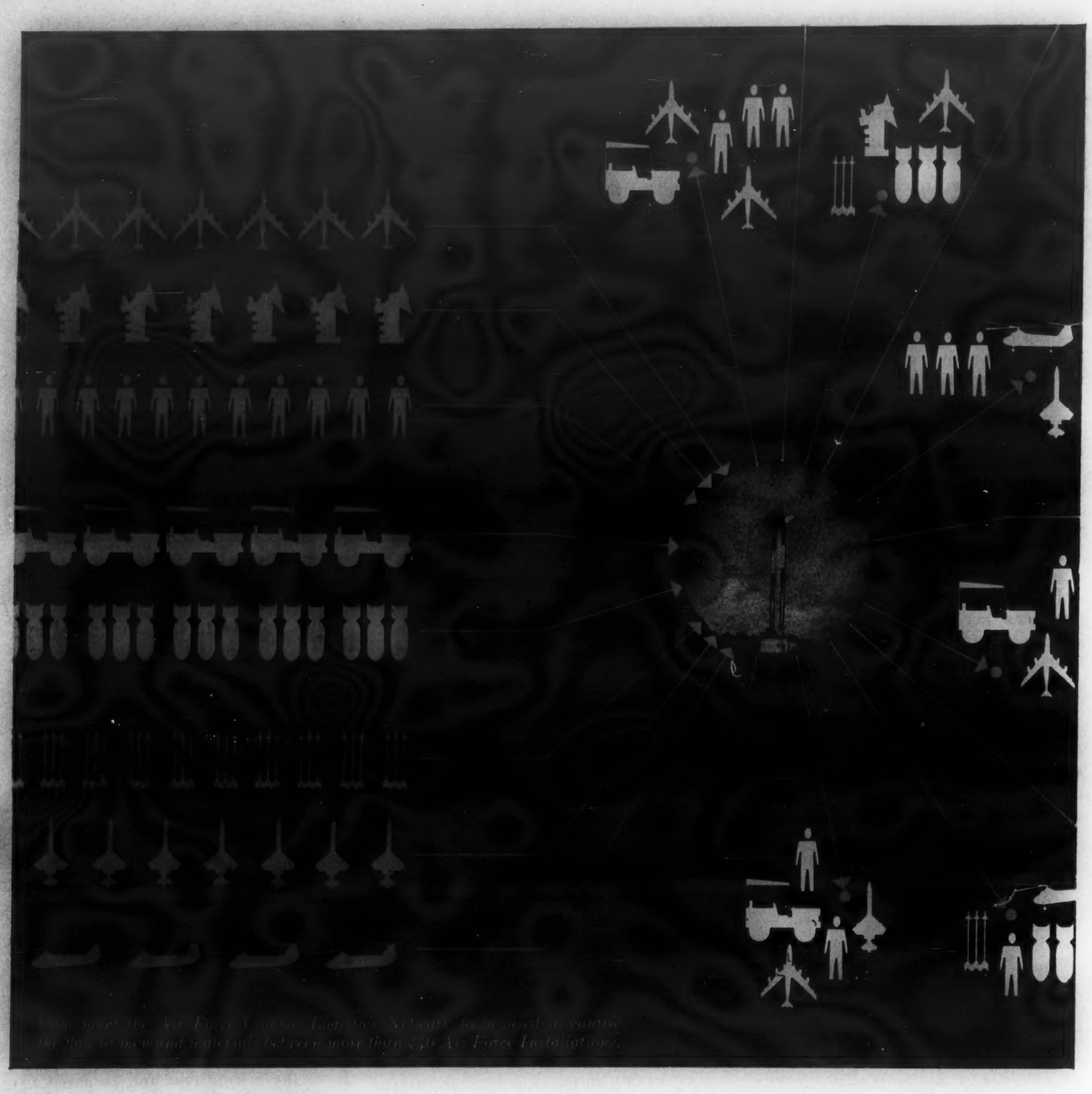
For those committees finding it possible and desirable in the interest of better interference control to do more than maintain a current directory of members and corrective action on RFI cases coming to their attention, the following additional activities are suggested:

1. Together with the directory, maintain and publish a manual of successful technical solutions to particular interference problems.

2. To the extent possible, without involving a conflict of interest among members who represent the various communication services, participate as a committee in international studies relative to RFI conducted by the CISPR and CCIR study groups. Information regarding these studies can be obtained from the Telecommunications Division of the Department of State. Also, submit comments on FCC proposed rule making wherever it has a bearing on RFI, e.g., Parts 15 and 18 of FCC Rules governing Incidental and Restricted Radiation Devices, and Industrial, Scientific and Medical Services, respectively.

FCC Support

I have given instructions for the FCC Engineers in Charge and their staffs at the district offices to help in any way possible to further the CIC program. They are not members of CIC's but are available to help form the committees and to assist in resolving interference cases. The Engineers in Charge help to interest well known persons in the communications field to undertake the formation of a committee and are pleased to meet with a group at any time to explain the program. After a committee is organized, the FCC Engineer in Charge works closely with its members. He refers interference complaints to the committee if, in his opinion, they are of the type that the committee can handle. Of course, the committee gets industry-type interference complaints directly, when its existence becomes well known. If a difficult interference case cannot or should not be resolved by the committee, it is referred to the FCC for investigation.



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WESTERN UNION...*finds better ways to speed it electronically*

ASW aircraft from Hunter-Killer Group Carrier proceed to the contact area

the Navy's Voice of Command, a Challenge to American Industry

by LT. MARC A. ARNHEITER, USN

Presentations Coordinator
for the Office of
the Assistant Chief of
Naval Operations (Communications)

GENERAL THOMAS POWER, USAF, Commander-in-Chief of the Strategic Air Command, made an observation before a Congressional Committee which could well have reflected the thinking of any member of the Joint Chiefs of Staff.

He said, "Without communications, I command nothing but my desk and it is not a very lethal weapon."

This statement is particularly applicable to the Navy since it depends completely upon rapid, dependable and secure communications in order to perform its mission.

With its operating fleets and units scattered over most of the earth's oceanic surfaces, the Navy is without value to the government and people it serves unless it maintains effective and reliable two-way communications between its individual operating elements and High Command. At a time when our nation must be prepared to deliver retaliatory war strikes within fifteen minutes, our fleet units must be ready constantly to move into appropriate action in the Indian Ocean, for example, or in the North Atlantic. To do so, naval communications must be capable of providing a smooth and reliable flow of message traffic related to operations, intelligence, logistics and administration. This capability must be maintained wherever the communicating components may be—on land, on sea, in the air or beneath the surface of the sea. The inter-linkages in the communications systems which serve the mobile combat forces of the Navy must be capable of providing the *kind* of communications required, whether it be voice, printing or pictorial. And the linkages must be sufficient in numbers to handle the swollen traffic which a national emergency would generate.

We know military communications-electronics as the *Voice of Command* and the *Arm of Control.* The existing communications networks of the military departments (Army, Navy and Air Force), which were originally established to meet individual service needs, have recently been ordered integrated to the extent that it has been possible to establish a single management organization—the Defense Communications Agency—to manage these systems as a single entity for all long haul, point-to-point transmissions. The directives which establish the Defense Communications System recognize both the common requirements and the special differences which characterize the communication systems of the individual military departments. The actual complete functioning of the Defense Communications System (DCS) under the authority and control of the Defense Communication Agency (DCA) is slated for March 1961. At present, the staff of the DCA is form-

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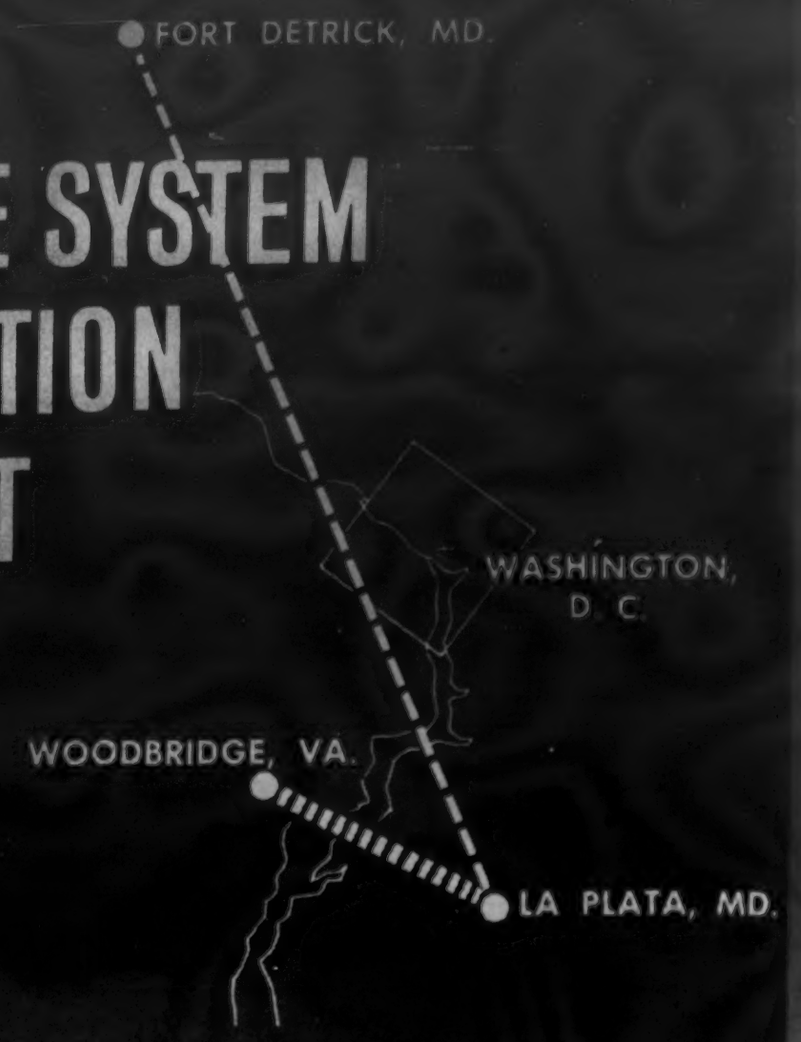
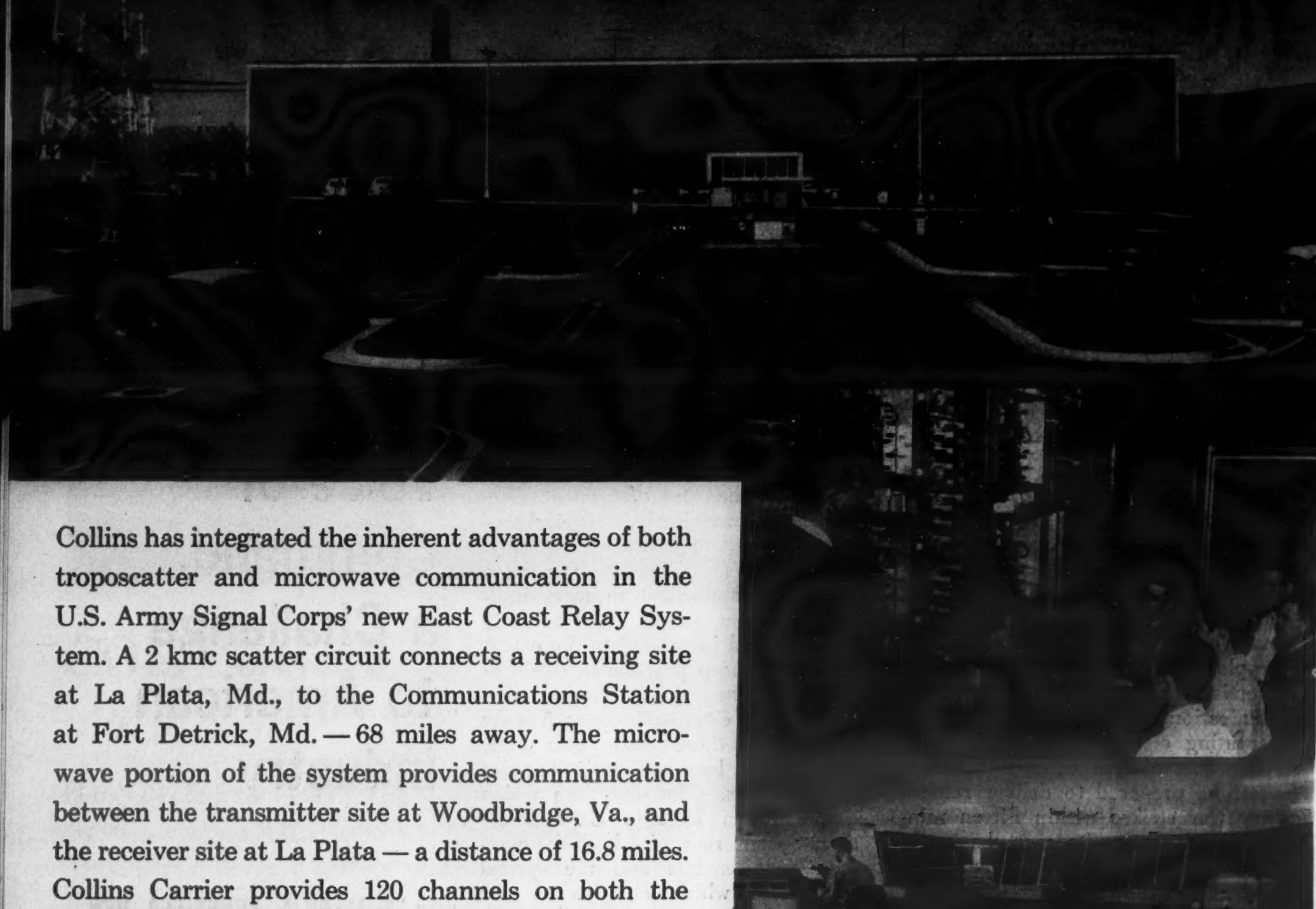
COLLINS SCATTER-MICROWAVE SYSTEM LINKS EAST COAST RELAY STATION AND ARMY'S WORLD-WIDE NET





Collins has integrated the inherent advantages of both troposcatter and microwave communication in the U.S. Army Signal Corps' new East Coast Relay System. A 2 kmc scatter circuit connects a receiving site at La Plata, Md., to the Communications Station at Fort Detrick, Md. — 68 miles away. The microwave portion of the system provides communication between the transmitter site at Woodbridge, Va., and the receiver site at La Plata — a distance of 16.8 miles. Collins Carrier provides 120 channels on both the microwave and scatter circuits. All incoming and outgoing national defense messages handled by the Army Signal Corps in the Washington, D. C., area will be processed through the new station.

COLLINS

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ulating plans for the assumption of control over the various linkages which will fall under its management authority when fully operational as an integral part of the DCS.

There is a definite need for military commanders as well as communicators, whether they be Army, Navy or Air Force, to know something about the complex and widespread tactical employment of naval forces, in view of the establishment of a central management organization which will in the future be responsible for handling message traffic from High Command at the seat of government direct to the operational task forces and units at sea, wherever they may be. Individual ships, submarines and aircraft are often called upon to perform independent tasks and missions in each ocean area. The direction, coordination, control and support of those operations demands the capability of exchanging communications within the forces involved and between them and their directing and supporting echelons. To meet this challenge, Navy communications must be able to provide interlinkages from and to any point on, over or under the surface of the sea; and it is necessary for the people who handle the message traffic to know where, when and how to route such communications. Furthermore, the planning, development, engineering and operation of the Defense Communication System must be closely coordinated with that of Naval Communications so that the fighting effectiveness of the mobile operating forces of the Navy will not be impaired.

Military maxims are often valid for naval operations as well as for land campaigns. The famous words of the Confederate General Nathan Bedford Forrest, explaining the secret of his success in battle, may be considered in such light. According to legend, he declared, "I git thar fustest with the mostest."

If the success of a modern naval action were to depend upon our ability to follow General Forrest's formula for victory, a prerequisite for our heeding his counsel would be unfailing, rapid and secure communications capabilities which would insure a smooth flow of messages for command and control of combat forces, as well as for the assured flow of communications for intelligence, weather, logistic and other administrative purposes. It is hoped that the establishment of the DCA/DCS will provide the Navy with an increased capability for dealing with an enemy force through better communications. Consider the naval action which would be generated in wartime by the receipt of intelligence indicating the presence of a hostile submarine (assumed to be a missile carrier) within a general area of ocean. For this example, we shall pinpoint the enemy position as somewhere within a hundred mile radius whose center lies 300 miles east of Norfolk, Virginia. We shall say that a patrol plane has detected the submarine, visually identified it and relayed the information, via air-to-air, air-to-ship, ship-to-shore and point-to-point circuitry, to various echelons in the intelligence chain. Therefore, interested receivers of this information would include the patrol plane's headquarters command, the Chief of Naval Operations, the Atlantic Command, Antisubmarine Defense Force Atlantic Headquarters, the Eastern Sea Frontier Headquarters, and innumerable subordinate commands, in addition to Headquarters U. S. Atlantic Fleet and Headquarters, Destroyer Force, Atlantic Fleet. Furthermore, the President, Secretary of Defense, Secretary of the Navy (and other Secretaries) as well as the Joint Chiefs of Staff, would be apprised of the situation. Under wartime conditions, coordination between high command and the operating forces must be complete. The success or failure of the operating forces in dealing with the intruder would be dependent upon all pertinent links in our national Defense Communications System as well as those existing solely within Naval Communications.

Evaluated as a threatening nuclear-weapon launcher, the submarine target would demand the ultimate in coordinated sea and air search, attendant to final destruction by our forces, in this wartime situation.

Naval Action

Naval action which might ensue probably would embrace the following lines:

(1) Additional aircraft, shore-based and armed with nuclear depth bombs, homing torpedoes and conventional weapons and fitted with submarine detection equipment, would be ordered airborne for systematic and coordinated (through good communications) search of the probable datum area (last known position of the submarine).

(2) All naval units in the area would be alerted.

(3) At least one Hunter-Killer Group already at sea would be notified and ordered to seek out, engage and destroy the enemy submarine.

(4) A general warning would be sent to all military and naval installations in the eastern United States as well as to the civilian populaces of all large cities or other probable or possible target areas.

(5) Continuing intelligence regarding the situation would be demanded by higher commands of the on-the-scene searchers.

The need for reliable and effective communications at the level of the tactical forces in the operating area would be underlined. With a Hunter-Killer group at sea, there is the capability to transmit and receive intelligence via ship-shore, ship-to-air, air-to-ship, broadcast and other means which go to help make up the world-wide communications networks of both the DCS and Naval Communications. These networks, designed primarily to meet the command and operational requirements of such a combat force, must be in peak operating condition. This is because they are the basic linkages which tie together the coordinated effort which in this instance is now in progress. By interconnection and cross connection, our Hunter-Killer Group's localized communications networks may become integrated with the long-haul circuits of high command.

Consider, now, the action taking place. First, we must assume that the submarine, with modern ECM (electronic countermeasures) equipment aboard, detected the original search (patrol) plane and may have intercepted the warning message transmitted by the plane to higher friendly command. Thus alerted, the submarine has dived to maximum depth and is seeking best depth in which to escape. This means that the submarine commander is endeavoring to ascertain the depth at which a thermal change in the sea occurs, and, when this has been determined, he will probably try to maneuver his boat at a depth under this layer. This would make detection by normal sonar detection devices most difficult, since sonar emissions are bent by changes in water temperature.

Meanwhile, the patrol plane has dropped listening devices (sonar-buoys) in the immediate area of the initial detection, and is attempting to regain contact with the submarine. The pilot continues to send situation reports, amplifying the current search to high command. This is done by using the plane's high frequency voice-radio equipment, although the pilot could have selected other modes

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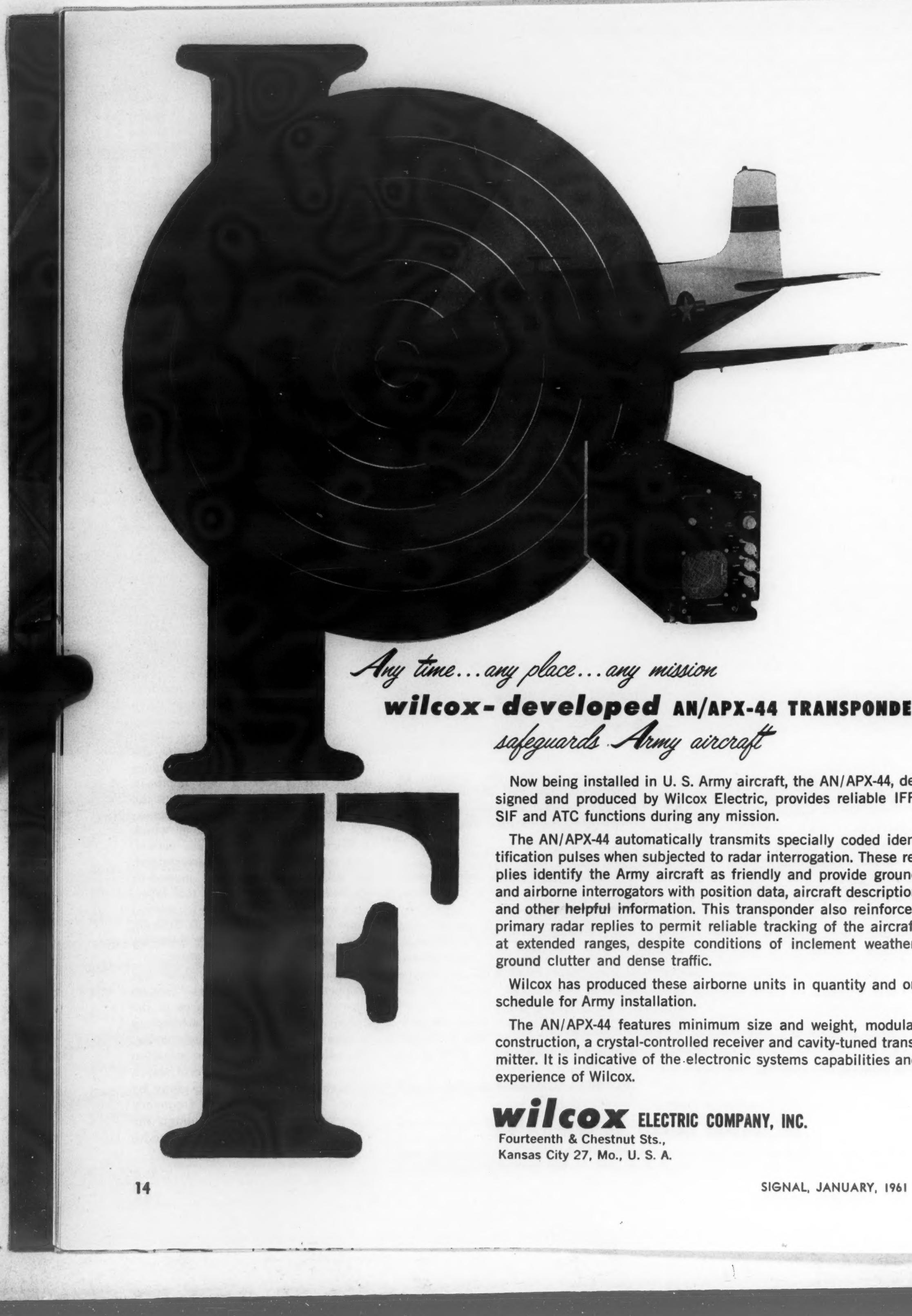

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safeguards Army aircraft

Now being installed in U. S. Army aircraft, the AN/APX-44, designed and produced by Wilcox Electric, provides reliable IFF, SIF and ATC functions during any mission.

The AN/APX-44 automatically transmits specially coded identification pulses when subjected to radar interrogation. These replies identify the Army aircraft as friendly and provide ground and airborne interrogators with position data, aircraft description and other helpful information. This transponder also reinforces primary radar replies to permit reliable tracking of the aircraft at extended ranges, despite conditions of inclement weather, ground clutter and dense traffic.

Wilcox has produced these airborne units in quantity and on schedule for Army installation.

The AN/APX-44 features minimum size and weight, modular construction, a crystal-controlled receiver and cavity-tuned transmitter. It is indicative of the electronic systems capabilities and experience of Wilcox.

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of transmission, including teletype, CW (hand wireless keying) and high speed digital transmission systems. Thus the patrol plane, because of its modern communications-electronics equipment, is able to serve as the on-the-scene link between our naval scouts hundreds of miles off our coastline and officials at the seat of government.

Within short order, our nearest at-sea Hunter-Killer Group has plotted the submarine's last known position and is moving rapidly to bridge the initial distance gap to the datum. The group, of which the heart is the large anti-submarine carrier laden with multi-type ASW aircraft and weapons, is alerted for enemy contact. Approximately a dozen local communications channels are activated for use by the tactical units of the group. The destroyers are deployed for maximum search effectiveness and helicopters join the destroyer screen for the carrier as the entire mobile force proceeds toward the scene of impending battle. Waves of search planes, all armed with lethal antisubmarine weapons, and equipped with a wide range of complex communications-electronics devices, fan out to conduct systematic and well-conceived searches of the immediate and general area in which the enemy sub is believed to be located. Coordination between all search units now becomes a vital necessity. Reliable, secure and rapid communications capabilities for this entire naval force are mandatory. The failure of communications in just one unit or element of the armada might mean failure in thwarting a nuclear attack from the sea.

Three hours after making its initial sighting of the submarine, the patrol plane picks up contact with the sub once again and succeeds in enveloping it within a ring of sonarbuoys. Situation reports from the aircraft to the approaching HUK group are continuous. When the range to datum has closed to twenty miles, the HUK commander orders his screen commander to detach a surface attack unit of several destroyers to proceed at best speed to the datum. Three high speed destroyers advance at flank speed and proceed toward datum, while the rest of the destroyers regroup around the carrier and with her turn to a heading designed to cut off escape of the submarine.

By now, three carrier-based ASW aircraft have made contact with the submarine through sensitive magnetic detection devices and the submarine is contained in a sonar circle made up of almost a dozen helicopters. The senior naval aviator at the datum is acting as on-the-scene commander. Using a special voice radio circuit designated as a primary ASW coordination net, this officer has commanded all aircraft at the scene and coordinated the efforts of all in detecting and holding the sub as well as in conducting airborne attacks. Further, this officer has transmitted regular and changing situation reports to the surface units proceeding to the scene. He has exchanged all available tactical information with the Surface Attack Unit commander — the senior destroyerman in one of the three destroyers advancing toward the action.

The SAU commander requests and receives permission from the aircraft commander to enter the submarine zone and when one of the destroyers establishes sonar contact with the submarine, the SAU commander relieves the aviator as contact area commander. Using a surface attack unit radio circuit, the Destroyerman orders his ships to commence zigzagging and weaving and prepares for imminent combat. Meanwhile, the President, through the Secretary of Defense and the Joint Chiefs of Staff, has approved the use of a nuclear depth bomb in disposing of this particular submarine. Within a matter of minutes after the Presidential decision to use an atomic weapon has been made, the Defense Communications Agency would route the order through the DCS complex. Through on-the-scene local naval communications interlinkages, the message from the Commander-in-Chief is relayed to the contact area commander.

Simultaneous Communications Essential

With positive sonar contact on the enemy submarine, now tracking at erratic speeds on rapidly changing and evasive courses at great depths, the contact area commander signals his destroyers to turn away and upwind from the known position of the enemy; orders all non-participating aircraft to clear the immediate area and into the wind and then proceeds to vector the killer aircraft to the submarine. Antisubmarine personnel in the Combat Information Center of the SAU commander's flagship plot the movement of both vectored aircraft, which they are controlling, and the submarine. The killer aircraft is started on its controlled approach over datum. The air-controller, using a voice-radio air control circuit, orders the aircraft to the desired heading for intercept and release of the nuclear weapon. A range count-down begins. The pilot of the killer aircraft hears the surface-ship naval officer's "Standby," and prepares to drop the bomb.

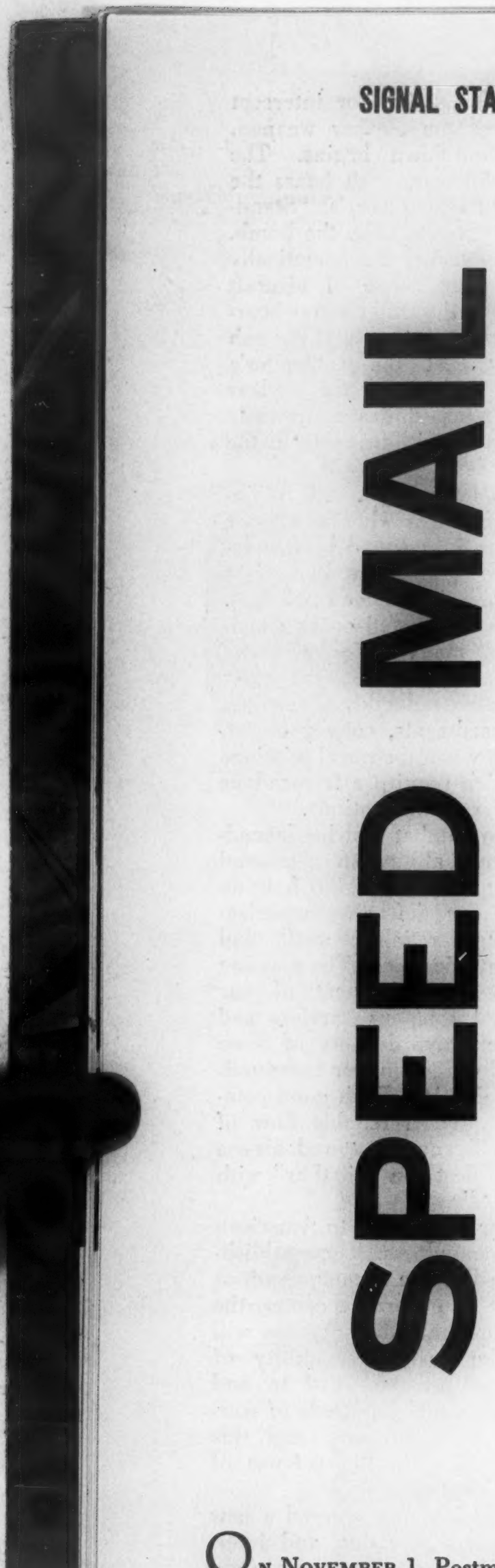
The air controller mathematically plots the closing range of aircraft to sub utilizing the ship's sonar bearings and notifies the plane if the sub track varies. At the controller's command, "Mark drop" the nuclear weapon is released instantaneously and the aircraft withdraws from the area.

The example cited was one of innumerable instances wherein a mass of communications would be mandatory for successful operation against even one submarine in one small spot. Such actions could well occur simultaneously in many different ocean areas, at the same time that other naval units are conducting air strikes, shore bombardments, convoy escorting, and other routine naval missions —all of which require a tremendous complex of communications.

Victory in combat will be dependent upon our ability to command our resources, our mobile fighting forces and our defensive organizations through reliable, swift and secure communications. The massing and intelligent deployment of our weapons and weapons carriers and the actual effective delivery of those weapons, hinges upon our communications capabilities. With good communications and a reliable flow of combat intelligence, scattered air-sea units of the fleet can "git thar" with "the mostest."

Sea power is essential to American military preparedness. The establishment of the Defense Communications System and its governing center, the Defense Communications Agency will augment the current capability of the Navy to get the word to and from the fleets and hundreds of warships and naval aircraft, and this may be decisive in the defense of the United States.

The world has now entered a new era of space exploration and international technological progress. Concurrent with the advances being made in all related fields, the Navy looks to American Industry and inventive genius for the development of better, quicker, more modern communications relays and links. By accepting this challenge, American scientists, engineers, technicians and industrialists will help to insure that the Navy and all the services can properly perform their manifold tasks under all conditions.



SIGNAL STAFF REPORT

ON NOVEMBER 1, Postmaster General Arthur E. Summerfield unveiled the Post Office Department's facsimile "Speed Mail" experiment to send and receive a letter per second in complete secrecy. Mr. Summerfield hailed the innovation as "another major landmark in the development of our American Postal System."

Experimental Speed Mail, operating between Washington, Chicago and the Civil Defense headquarters at Battle Creek, Michigan, transmitted official correspondence for more than 40 Federal agencies between the 3 cities. Although the new service has been limited to official correspondence, the Postmaster General said he hopes the experiment will show this system to be practical and economical for use by the public in sending preferred mail.

Speed Mail units are located in Washington and Chicago in the main downtown post office buildings and, in Battle Creek, in a Postal Substation located in the Federal Center Building which also houses the Office of Civil and Defense Mobilization. The system employs microwaves to send letters between these cities and then uses facsimile reproduction equipment to convert the microwave impulses into the printed letters.

The experiment with Speed Mail represents a major advance over the first experiments conducted by the Post Office Department a year ago. Since then, equipment has been developed to insure secrecy throughout in the facsimile process—the first such developments for postal use in history.

Here are the simple Speed Mail steps:

1. The sender types, writes, draws or otherwise imprints his message on a Post Office Department form similar to the "V-Mail" form of World War II.
2. The sender folds and seals the letter (this is the last time contents are seen by human eyes until it reaches the the addressee) and then mails it.
3. At the local post office, the letter is sent to the Speed Mail unit. One machine places a code mark on the letter which guides it through the electronic switching equipment — which directs it to the correct destination printing machine. It then goes to an automatic opening machine and from there to an electronic scanner which sends an image via standard TV-type communications lines (commercial coaxial cables or microwave communications links) to a distant point where an exact reproduction is made.
4. The letter is automatically folded and sealed. It is then delivered to the addressee in the normal delivery manner.

The scanner operates by sweeping a minute spot of light across the face of a cathode ray tube 360 times per second. The spot of light is focused on the letter being transmitted as the letter moves along a conveyor belt. The light is then reflected and picked up by a photo-multiplier tube, which puts out a voltage proportional to the reflected light. Since the light is reflected more from light areas of the paper than from the dark, a varying signal results. The scanner then shapes this signal into levels denoting either black or white which are transmitted to the printer. A similar cathode ray tube in the printer at the receiving end is synchronized with the scanner. Since the spot of light emitted by this tube is modulated by the voltage output from the photo-multiplier this varying light source is used to produce the transmitted image on the light-sensitive, electrostatically charged surface of a rotating xerographic drum. Black powder within the printer cascades over the drum, adhering only to the areas which have not been discharged by the light beam. As the drum rotates, the powder is transferred to ordinary paper. Heat then fuses the powder into the surface of the paper, making the printed material fixed and permanent.

The basic sending and receiving system between Washington and Chicago consists of 4 sending and 4 receiving units in Washington, D. C. and 4 sending and 4 receiving machines divided between Chicago and Battle Creek (3 in Chicago and 1 in Michigan). Each sending and receiving unit can handle one letter every 4 seconds. Therefore, Washington can send one letter every second and, simultaneously, receive one letter every second. The Mid-West System can also send and receive one letter a second between the two cities, although, of course, Chicago can send and receive at a faster rate than Battle Creek, because of its greater number of machines.

In addition to the basic system of 4 units each, the Washington and Chicago Post Offices actually have three additional receiving units. These are regarded in theory as "satellite" receiving units, and would —under future normal operating conditions—be placed out in a suburban post office for example, one of the Washington machines would be placed perhaps in Silver Spring, Maryland.

Postal Engineers have suggested a nation-wide network of Speed Mail stations in 71 big post offices at strategic points. The plan would provide direct Speed Mail links between major population centers of the Nation. The developers of Speed Mail believe it would be a relatively simple matter to link eventual communications satellite networks with the electronic mail-delivery system to pro-

vide a world-wide Speed Mail service. Last November 11, a Speed Mail letter was transmitted from Washington, D. C. to Newark, N. J., by using the Echo satellite as a relay station. (Editor's note: An Echo commemorative stamp was issued December 15 by the Post Office.)

Major Differences of System

The Post Office Department's system is basically the same as facsimile transmission systems in use in industry and business for many years. However, the postal experimental application differs in these two major respects: It uses the latest and fastest equipment; for example, it is one hundred to four hundred times faster than equipment used by wire news services to transmit photos. It has additional equipment, never before available, to insure secrecy of the material being transmitted.

In addition to sending and receiving standard typewritten or handwritten letters, the system can transmit the most complicated and detailed drawings, charts, blueprints, etc. Since it reproduces copy exactly, it cannot make an error in the transmission process.

"Speed Mail as developed experimentally to date by the Post Office Department," Mr. Summerfield explained, "combines the most modern techniques of private industry with the basic research done by the Department of Defense and other Government agencies.

"The Post Office Department is deeply indebted to the Ad Hoc Cabinet Committee on Facsimile Mail, appointed by President Eisenhower under my chairmanship and consisting of Treasury Secretary Anderson, Attorney General Rogers, Commerce Secretary Mueller, Civil Defense Director Hoegh and the Assistant Secretary of Defense for Logistics, Mr. McGuire, for their helpful cooperation."

At this point, the Speed Mail project is the result of the cooperative efforts of the following companies: International Telephone & Telegraph Corporation — Prime Engineering Contractor; The Intelex Corp., a subsidiary of ITT—Systems manager; Stromberg-Carlson Division, General Dynamics Corp.—Scanning and receiving; Pitney-Bowes Company — Format opening and transporting; Haloid-Xerox, Inc. — Output reproduction; Baum Folder Company—Output folding and perforating; Bell & Howell Company—Envelope inserter-sealer.

Orbiting spacecraft of NASA's Project Mercury will be tracked by a global arrangement of 18 communications stations.

Keeping track of a man in orbit

One day this year, the first U.S. astronaut may be rocketed into a globe-circling orbit, some 120 miles in space. Although he will be a mere dot in the heavens, a vast world-wide network of eighteen tracking stations—including two operating from ships at sea—will provide monitoring of every phase of the high-flying astronaut's journey in his orbiting spacecraft.

Linking each of the tracking stations with the project's Space Flight Center at Greenbelt, Maryland, and Mercury Control Center at Cape Canaveral, Florida, will be an array of Teletype equipment—Model 28 page printers, automatic send-receive sets and punched tape units. These Teletype communications devices will record and relay flight data collected by tracking and telemetering equipment from the spacecraft's instruments to the Flight Center, where an elaborate complex of data processing machines will coordinate and interpret flight data and provide directive information for the world-wide network of tracking stations.

Teletype Corporation is indeed proud to be a part of the Western Electric industrial team selected by the National Aeronautics and Space Administration (NASA) to build the vast communications network so vital to Project Mercury.

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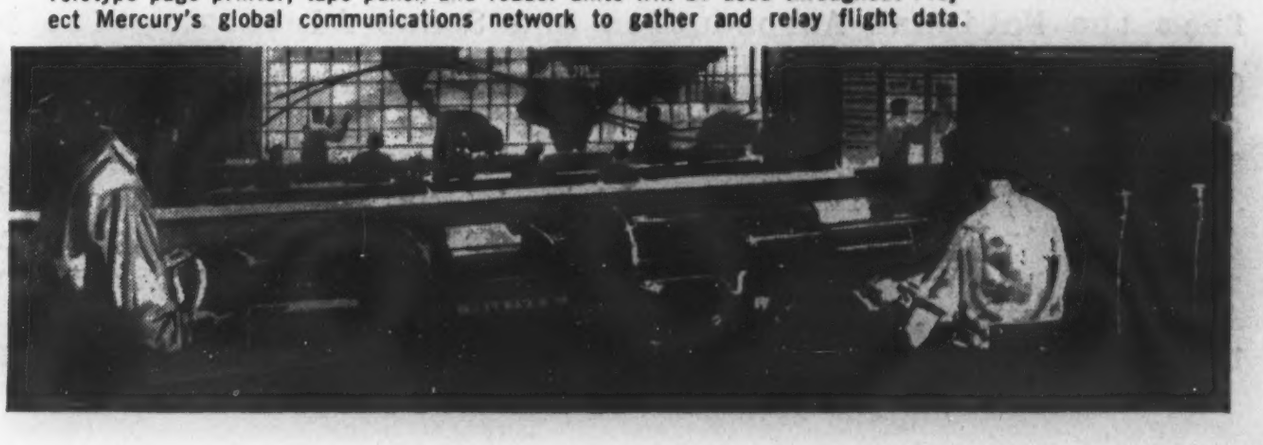
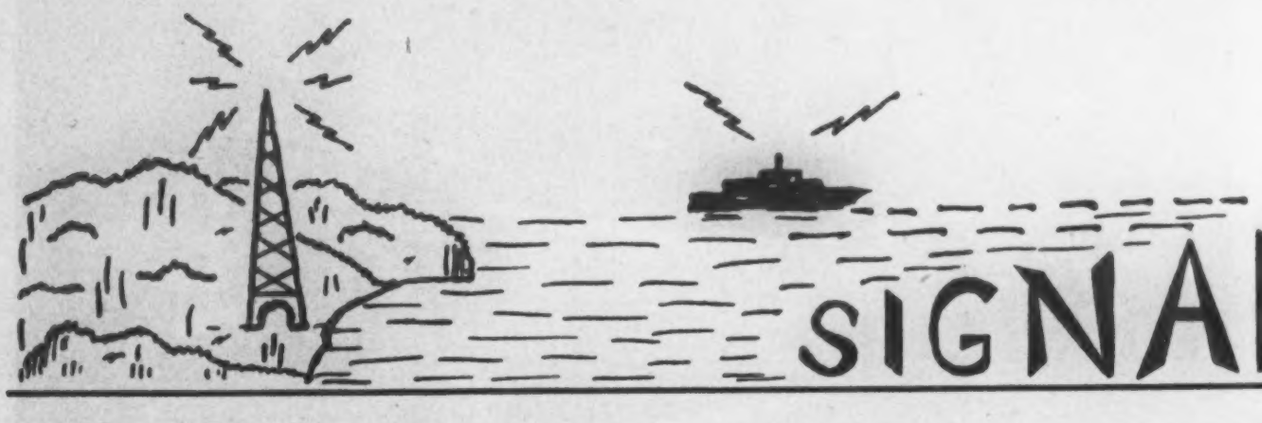
Teletype page printer, tape punch and reader units will be used throughout Project Mercury's global communications network to gather and relay flight data.





SIGNAL·GRAM

U. S. SPACE FEATS IN NOVEMBER AND DECEMBER

NAME/LAUNCH DATE	LAUNCH POINT/SPONSOR	PURPOSE/OR RESULT
Explorer VIII Nov. 3	Atlantic Range NASA	Ionospheric study to aid space communications
Discoverer XVII Nov. 12	Pacific Range Air Force	Recovery of orbited space capsule on 31st pass by aircraft
Tiros II Nov. 23	Atlantic Range NASA	Cloud cover photographs and heat balance measurement between earth and the sun
Discoverer XVIII Dec. 7	Pacific Range Air Force	Recovery of orbited space capsule, which contained particles of human tissue, on 48th pass by aircraft

— GOVERNMENT —

AIR FORCE SATELLITE INSPECTION SYSTEM might be able to rendezvous with unknown satellites in orbit for identification purposes, according to the Defense Department. The Air Force Ballistic Missile Division, with technical supervision by the Aerospace Corp., is working on a research and development program directed toward demonstrating the feasibility of such a system. Radio Corporation of America will develop the final stage vehicle and the inspection payload.

NASA TEST SUPPORT OFFICE has been established at the Pacific Missile Range, Point Mugu, Calif. The new office is part of the Launch Operations Directorate, George C. Marshall Space Flight Center, Huntsville, Ala. A central NASA activity at the Pacific Missile Range, the new office will be headed by Navy Commander Simon J. Burttschell, who has been assigned to NASA by special arrangement with the Navy Dept.

SPASUR AND SPACETRACK now report directly to the Commander-in-Chief, Continental Air Defense Command at Colorado Springs, Colo., and form a part of the continental defense system under the over-all operational control of the Commander-in-Chief, North American Air Defense Command. Extending across most of the southern United States, SPASUR (Space Surveillance Detection Net) is a satellite detection fence developed by the Navy for ARPA to discover, identify and predict orbits for non-radiating satellites. SPACETRACK (National Space Surveillance Control Center) was established by the Air Force for ARPA to receive, analyze and catalog orbital data received from SPASUR and other sources. Now, through coordination effected by the DOD-NASA Aeronautics-Astronautics Coordination Board, information on space vehicles will be available to the world's scientific and engineering communities from the National Aeronautics and Space Administration rather than from SPACETRACK.

GOVERNMENT CONTRACTING PROBLEMS will be outlined at a series being offered in four cities this spring. Sponsored jointly by the National Security Industrial Association and Harbridge House, Inc., the courses will be given at Washington, D. C. (Jan. 30-Feb. 10); New York City (Feb. 27-March 10); Boston (March 13-March 24); Los Angeles (April 10-April 21). These management courses are concerned with the procurement procedures of the Department of Defense, National Aeronautics and Space Administration, Atomic Energy Commission and other defense related agencies. Registration data available at National Defense Education Institute, Washington, D. C.

(*Continued on page* 20)

"MIDAS" REPORTS

through communications equipment by Philco

MIDAS II, the experimental "sentry in space," is the forerunner of a series of satellites that will detect the launching of ballistic missiles anywhere on earth and instantly relay the warning. Its entire communications system was designed and produced by Philco's Western Development Laboratories for the U.S. Air Force, as associate contractor with Lockheed.

This is another example of Philco's leadership in advanced electronics that is contributing to our national defense . . . in satellites, missiles, weapons systems, communications and data processing. For vast capacity, facilities and experience, look to the leader . . . look to Philco.

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NEW DATA ON ULTRAVIOLET RADIATION IN THE NIGHT SKY may be available as the result of a recent Navy rocket launching. Fired from the White Sands Missile Range in N. Mex. by U. S. Naval Research Laboratory Scientists, an Aerobee-Hi rocket soared 131 miles to measure the effects of the sun on the earth's upper atmosphere. The experiment, which took place Nov. 9, is expected to supplement and perhaps revise existing theories about the atomic structure of night airglow. Data gathered by NRL's nightglow studies, may, in addition to providing knowledge about the earth's atmosphere, influence future radio communications with satellites.

ARMED FORCES SUPPLY SUPPORT CENTER has improved its data processing facilities to provide more efficient management of military supply services. A nation-wide computer and communications center was dedicated Dec. 8 at the Washington, D. C. center. AFSSC is a joint center of the military services under the authority and control of the Secretary of Defense.

CONTRACTS: ARMY: Goodyear Aircraft Corp., continued research and development on Nike-Zeus anti-missile missile system, $5.3 million; Radio Corporation of America, Defense Electronic Products Div., research and development on the Downrange Anti-missile Measurements Program, $2 million. NAVY: Johns Hopkins Univ., Applied Physics Lab., continued research and development of guided missiles, $26.8 million; Vitro Labs., continued coordination and testing of Polaris weapon system on nuclear-powered submarines, $8 million. AIR FORCE: Avco Corp., Electronics and Ordnance Div., continued production of FPS-26 height finder radar, $8.2 million (letter contract); Westinghouse Electric Corp., continued development of molecular electronics systems, $2.3 million.

— INDUSTRY —

THREE FIRMS have been selected by the National Aeronautics and Space Administration to conduct individual feasibility studies of an advanced manned space craft as part of Project Apollo. The firms are General Dynamics Corp., Convair Astronautics Div.; General Electric Co., Missile and Space Vehicle Dept.; The Martin Co. Each received a $250,000 contract which will extend for six months. Project Apollo is the name given the next development effort in manned space craft after Project Mercury, the present U. S. program to put a man in space.

SCRAMBLE TELEPHONE SYSTEM for providing private telephone conversations, unintelligible to any outside listeners, has been designed by Delcon Corp. The Delcon Security Telephone is a portable, transistorized electronic voice scrambler which converts the human voice into incoherent sound that cannot be understood unless restored to normal speech by means of a second instrument. Security telephones are used in pairs. One at each end of a telephone conversation is required. The first unit receives and scrambles the normal speech before applying it to the local telephone microphone. The second unit takes the scrambled speech from the distant telephone earphone and unscrambles it for the listener. It is not possible for a third party to monitor the call, according to Delcon.

HUGHES AIRCRAFT CO. has built a machine designed to study effects of nuclear radiation on missiles. The machine, a linear electron accelerator, produces a single high-intensity pulse of about 10 million volts of gamma radiation. By studying missile components subjected to these radiation pulses, Hughes engineers will be able to determine how a component would be affected by a nuclear environment

SURVEY OF MANAGEMENT PRACTICES used by the Air Force and its major contractors is being undertaken in the hope that improvements can be effected in the acquisition of weapon systems, according to the Defense Dept. Ordered by Secretary of the Air Force Dudley C. Sharp, this survey is an extension of a long-standing Air Force program to improve weapon system management and to assure quality production at a reasonable cost. A principal objective of this research program is to determine whether present management methods will continue to keep pace with the rapidly advancing technology of modern weaponry. The Titan ICBM program conducted by The Martin Co. has been selected as the initial project to be studied.

GRUMMAN AIRCRAFT ENGINEERING CORP. will develop an orbiting astronomical observatory under a contract from the National Aeronautics and Space Administration. Astronomers will use telescopes in the OAO space platform to study cosmic phenomena obscured to ground observatories by the earth's atmosphere. Grumman proposes an eight-sided satellite, 9½ feet high and 6½ feet in diameter. It will weigh about 3200 pounds, including 1000 pounds of experimental equipment. NASA plans to launch the first OAO in late 1963.

(*Continued on page* 23)

THIS TROUBLE HAS NO FUTURE!

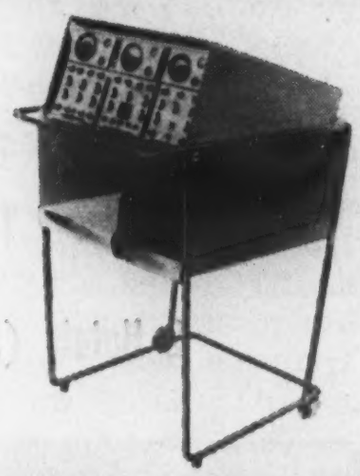
Radiation's TDMS anticipates circuit failure in telegraph and data transmission links without interrupting traffic

Radiation's Telegraph Distortion Monitoring System—TDMS—is a compact, self-contained unit for continuous on-line monitoring, testing and analysis of telegraph and data transmission links.

Its sensitivity to signal distortion is so acute that it can locate and describe equipment misalignment *before* it becomes an operational problem.

TDMS does its job without interrupting traffic and in a language that is easily interpreted by a nontechnical operator. Thus, in our illustration above, a line that is becoming increasingly capacitative can be located and rectified prior to circuit failure.

For detailed information on the TDMS, write Dept. S-1, Products Division, Radiation Inc., Melbourne, Florida. Refer to Bulletin RAD-E-100B.



TDMS performs all of these *on-line* functions: 1. Distortion transmitter; 2. Test message transmitter; 3 Distortion analyzer; and 4. Linear wave-form analyzer.

Among available accessories are utility cart (shown above), portable power supply, and relay-test adapter.

RADIATION INCORPORATED

New Horizons With Time And Distance in Full Retreat

Each year, two of the outstanding features of the AFCEA Annual Convention are the informative panels and the excellent social events. This year they will be of the same high quality. The 1961 panels are:

(1) Government Procurement and Contracting Stressing Fields of Communications and Electronics
(2) Scientific Applications of Photography as Related to Communications and Electronics
(3) Present Status and Future Concepts of World-Wide Communications
(4) Industry Report on Research and Development

The social events planned include:

(1) Buffet with Fabulous Floor Show
(2) Keynote Luncheon
(3) Banquet
(4) Industrial Luncheon

15th AFCEA Convention • June 6, 7 and 8, 1961
Tuesday—Wednesday—Thursday • Washington, D. C.

2 Hotels (Practically Adjoining) of Fabulous Exhibits Featuring New Horizons

SMALL BUSINESS FIRMS received $3,578,000 during fiscal year 1960 in military subcontract payments from 293 large companies enrolled in the Defense Small Business Subcontracting Program, according to a report issued by the Defense Dept. This is the largest annual total reported since the program began in July 1956.

MINUTEMAN TELEMETRY SYSTEM developed by Radiation Inc. will receive, monitor and record information from all the digital telemetry and guidance equipment in the Air Force solid fuel missile. Consisting of a bank of eight full cabinets integrated into a continuous unit, the ground PCM/FM system will display and record on permanent charts, both the telemetry information and data previously recorded on magnetic tape.

AIRTRONICS, INC. is constructing a $1 million plant in Bethesda, Md., which will more than double the facilities of the firm and will permit its further expansion into the commercial electronic instruments and communications fields, according to a company spokesman. A subsidiary of Scovill Manufacturing Co. of Waterbury, Conn., Airtronics does work in research, development and manufacturing of electronic and space instruments.

AT ELECTRONIC INDUSTRIES ASSOCIATION QUARTERLY MEETING more than 200 representatives of member companies heard committee reports on military marketing, cost principles and general contract provisions during the three-day gathering in San Francisco last month. The Spectrum Committee discussed the outlook for legislative or executive action in 1961 designed to modernize the allocation and administration of radio frequencies. Special guests included Federal Communications Commissioner Robert E. Lee, who discussed the FCC's upcoming tests on the feasibility of UHF TV and significance of the tests to future TV channel allocations; and Dr. Edward G. Witting, Deputy Director of Research, Office of the Secretary of the Army, who spoke on "Future Aspects of Microminiaturization."

CHANCE VOUGHT CORP. is the new corporate name for the Dallas aerospace company formerly known as Chance Vought Aircraft, Inc. The name change was made to reflect more accurately the company's diversity.

SCHEDULED ATLAS RADIO GUIDANCE SITES all have been completed on time, according to General Electric Co., who did the installation and checkout of the radio command guidance systems at the three Atlas intercontinental ballistic missile sites—Offutt AFB, Neb., Vandenberg AFB, Calif., and Warren AFB, Wyoming. The radio command guidance system for Atlas tracks the missile with high precision and relays signals to the missile to make any necessary corrections in its flight path. Later, when the proper velocity and trajectory have been achieved to pinpoint the target, the guidance system sends a signal from the ground-based equipment at the launch operations building to the missile to cut off its engines. The Air Force will integrate the radio guidance system with other portions of the Atlas weapon system as they become operational in coming months. GE's Defense Systems Dept. performed its work under an Initial Operational Capability Program for the Ballistic Missile Division of the Air Research and Development Command.

X-15 ROCKET SHIP PROGRAM will be aided by a radar display and computing system designed by the Defense Systems Dept. of General Electric Co., under a half-million dollar contract from the National Aeronautics and Space Administration. Called Terminal Guidance and Data Facility, the system uses a GE Model 225 high speed computer as its electronic brain. The computer combines information from several radar stations along the X-15's 400-mile flight path and presents it as a single integrated display for the Terminal Guidance Director at Edwards AFB, where the rocket ship is being tested. A major purpose of the system is to maintain surveillance of the X-15 and to assist the pilot in making his landing approach.

C-E-I-R, INC. has signed a contract providing for an economic merger with the DATA-TECH Corp. of Hartford, Conn., a company specializing in electronic data processing services for the New England area. The third announced merger for C-E-I-R in the past five months, this merger will expand the Arlington, Va. firm's operations in New England, and will enable the firm to establish a new Research Center in the area with "an immediate and sizeable backlog of contracts," according to Dr. Herbert W. Robinson, C-E-I-R President. The previous two mergers were with General Analysis Corp. of Los Angeles and Engleman & Co., Inc. of Washington, D. C.

Megawatts for NIKE ZEUS...

With a booster of over 450,000 pounds of thrust, NIKE ZEUS will need still another form of power to fulfill its anti-missile assignment. This other power is in millions of watts – energy for the system's extended range target tracking and discrimination radar transmitters.

Developed for the Army by Sperry out of its long experience in high power radars, and employing giant-wattage Sperry klystron tubes, the target tracking transmitters will permit greater-than-ever capability for radar tracking of "hostile" targets. The discrimination radar is designed to classify targets according to the nature of the threat.

NIKE ZEUS – the nation's only anti-missile missile system now in the advanced development stage – is undergoing R&D and pre-production programming under the Army Rocket and Guided Missile Agency (ARGMA) cognizance, with Western Electric as prime contractor and Bell Laboratories responsible for the overall system. It is the only missile system now in development for intercepting ICBM's . . . to defend our cities and defense sites.

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SURFACE ARMAMENT DIVISION, *SPERRY GYROSCOPE COMPANY–DIVISION OF SPERRY RAND CORPORATION, GREAT NECK, N.Y.*

— GENERAL —

VOA RADIO STATION planned to be the most powerful long-range broadcasting station in the world will be constructed near Greenville, N. C. by Alpha of Texas, Inc. and Continental Electronics Manufacturing Co., the U. S. Information Agency has announced. The radio project, expected to be in operation by the end of 1962, will consist of six 500 kilowatt, six 250 kilowatt and six 50 kilowatt transmitters, and other equipment. The facility will give the Voice of America, the worldwide radio network of USIA, a stronger signal to Europe, Africa, the Middle East and South America.

NEW CHANNEL OF COMMUNICATIONS FOR PILOTS may make it possible for them to receive messages by a touch system rather than by the conventional means of sight and sound. This touch system involves the change of vibrations, or frequencies of the voice, into mechanical vibrations which a pilot can feel by placing a small plate in contact with the skin. The area of the pilot's chest is believed more receptive to pulses then other parts of the body. The system could be particularly useful when a pilot's hearing or vision had been impaired by injury, weather or environmental conditions. Now being studied by the Human Engineering Laboratory of the Rome Air Development Center, this system is "strictly in the research stage," according to Richard A. Newman, psychologist at RADC, who discussed the touch system at the Air Research and Development Command's Seventh Annual Science and Engineering Symposium last month.

NINE MISSILE MASTER CONTROL CENTERS were installed in strategic areas throughout the United States in 1960. Designed, developed and produced by the U. S. Army Signal Corps and The Martin Co., Missile Master is an electronic brain which controls, coordinates and integrates the fire of Nike guided missile units. The system is considered a vital link in the air defense of North America.

FUTURE OCEANIC TELEPHONE SYSTEMS will be more easily constructed through the use of a specially-designed ship now being built to lay newly-developed telephone cables and amplifying equipment. The vessel, scheduled to be completed in 1962, will be the world's largest cable-laying ship, according to American Telephone and Telegraph Co., who made the announcement about the ship. Powered by a steam-turbo system, the ship will be able to carry some 1800 miles of deep-sea cable and will be equipped with laying gear designed by Bell Telephone Laboratories. Special features will enable the ship to operate in most weather conditions. Gibbs & Cox, Inc., New York naval architectural firm, designed the ship. She will be built by the West German shipyard, Schlieker Werft, in Hamburg.

COMMUNICATIONS MOON RELAY SYSTEM was used to transmit information between Washington, D. C. and Hawaii during a magnetic storm in November when the effect of the solar flares on the ionosphere made other means of communications difficult. Designed and developed for the Navy by Developmental Engineering Corporation, CMR is not vulnerable to solar disturbances since it operates in the UHF band, DECO said. During this period, the Navy moved messages over four channels of teletype each way, at the rate of 240 words per minute, according to the firm. Previously, the system for bouncing radio signals off the moon had been used only on a part-time basis in an evaluation test program begun last September.

RADIATION-RESISTANT SOLAR CELL has been developed by U. S. Army Signal Corps scientists at Fort Monmouth, N. J. This development is believed to be an advance of major importance to space operations in which solar cells are used as the principal source of electric power for electronic equipment in satellites and space probes. The advance is considered the most important in the field since the first solar cell was produced in 1954, according to the Defense Dept.

AMERICAN BATTLE MONUMENTS COMMISSION dedicated its World War II American Military Cemetery and Memorial in Manila last month. In the cemetery are buried 17,182 Americans who died during four years of warfare in the western and southwest Pacific regions. Prior to the Manila dedication, the Commission dedicated its West Coast Memorial in the Presidio of San Francisco to the 412 United States World War II missing in the American coastal waters of the Pacific.

CALENDAR OF EVENTS

JANUARY 16-18: Seventh Annual Meeting of the American Astronautical Society, Sheraton-Dallas Hotel, Dallas, Tex.

JANUARY 17-19: Instrument-Automation Conference and Exhibit, sponsored by the Instrument Society of America, St. Louis, Mo.

FEBRUARY 1-3: Winter Convention on Military Electronics, sponsored by the Institute of Radio Engineers, Biltmore Hotel, Los Angeles, Calif.

MOBILIZING TALENT FOR NATIONAL SECURITY

by SENATOR HENRY M. JACKSON

IT IS WELL TO REMEMBER that the international contest in which we are now engaged may drag on for decades without reaching the hot war stage. If only a hot war can be classified as a national emergency, then we simply do not understand the nature of the cold war we are in.

Let us not forget that the Communists think in terms of power. Superior power will, they believe, eventually prevail. They do not merely plan to outstrip us militarily. They propose to have better factories than ours, better scientific laboratories, better schools, better houses, better farms, better cities, and yes, a higher standard of living than ours.

By beating us in one field after another, the Communists plan to show to the world that their system represents the inevitable wave of the future, and that there is no real alternative except to join forces with them.

As long as the costs of a hot war seem too high, and other means are at hand, we can expect the Kremlin to pursue its goals without resorting to overt aggression. The offensive will be pressed on all fronts, economic, military, political and psychological, and in all corners of the globe. If successful, loss of the cold war could be as final, and as fatal, as defeat in an all-out war.

So if we are talking about mobilization, I think we have to be mobilized constantly to deal with the demands and challenges of the cold war. And if we expect to put our best foot forward, we must seek new ways to solve the critical problem of finding able citizens to serve their government now, fulltime, and in the years of total competition which lie ahead.

We need and must have the best scientists, the best engineers, the best lawyers, the best diplomats, the best planners and the best administrators this country has to offer. Above all, we need the finest leadership, at the cabinet and sub-cabinet levels throughout government, which we can produce. On the decisions made and actions taken by this small group of men at the heart of the governmental process hangs the success of our national security policies, and thus our survival.

These men must be experienced in the arts of government. They must be able to cope with the most complex economic, scientific, military, and political factors. They must be able to go to the core of a problem, reach decisions and provide aggressive leadership. This calls for the best brains, the finest talent we can muster. Unless we can dedicate leader-

Sen. Jackson made the remarks presented here at the 2nd Nat'l. Conference of the Nat'l. Defense Executive Reserve last year.

Sen. Jackson (D., Wash.)—chairman, subcommittee National Policy Machinery of Senate Government Operations Committee; member, Senate Armed Services Committee and chairman, Military Applications subcommittee, Joint Committee on Atomic Energy—confers with President-elect Kennedy.

ship of this calibre to government service, we cannot expect to succeed in the drawn-out contest with the Sino-Soviet bloc.

The Senate Subcommittee on National Policy Machinery, of which I am chairman, is charged with the task of determining whether our government is now properly organized to meet successfully the challenge of the cold war. The fundamental problem is: How can a free society organize to out-think, out-plan and outperform totalitarianism, and achieve security in freedom.

Our study is being conducted throughout on a scholarly, objective and nonpartisan basis. We face a national task far transcending either political party or any particular administration.

At our first public hearings in February 1960, we invited four distinguished Americans, Robert A. Lovett, Robert C. Sprague, Dr. James Phinney Baxter and Thomas J. Watson, Jr., to give us their estimate of the nature and scope of the problems confronting us in the decades of competition ahead. In late April, seven eminent authorities gave us their counsel on the problems involved in gearing science and technology into the policy process. In May we invited seven noted experts from government, business and law to give us their views on the problem of attracting first-rate talent to man key posts at home and abroad.

From the outset of our study, we have recognized that human talent is our most precious asset; that good people often triumph over poor organization; that poor people will defeat the best organization.

In sum, the testimony we heard on this subject was neither optimistic nor complacent. All our witnesses recognized the urgent need to summon our best brains to Washington to formulate and direct the battle plans of the cold war. As Harold Boeschenstein, the president of Owens-Corning Fiberglas, told us: "We must put our 'first team' in the field." He, and all our witnesses, recognized our failure to attain this goal in many respects. In general, they were somewhat pessimistic in their forecasts of our ability to field the first team unless we change some archaic laws and antiquated attitudes.

Based on our hearings and our studies of this problem, there are some key points which affect our ability to attract first-rate talent.

1. Much of our recruiting has been on a haphazard basis. There is no orderly attempt to catalog our human resources and use them wisely. Nowhere in government do we have a central office to assist the departments and agencies in finding the right man for the right job. Marion Folsom of Eastman Kodak, a former member of President Eisenhower's cabinet, testified that: "One reason the service of so many businessmen is so short is that they were not properly placed in the first place. The present system," he said, "is too much hit or miss."

2. Many men appointed to high posts in the national security field have little acquaintance with the intricate problems they are called on to resolve. A former government official and member of the Gaither Committee, John Corson, now a management consultant who worked on recruiting for the Executive Branch when President Eisenhower first took office, told us that:" . . . few Presidential appointees bring to these jobs, in addition to substantial personal talents—and surely I am not questioning their large abilities—real experience in the complex problems this country faces in the field of national security and a knowledge of what it takes to operate effectively in Government in Washington." Let me add that this comment applies to all recent administrations.

3. The government has been plagued with high rates of turnover in key posts. Roger Jones, the chairman of the Civil Service Commission, told us that turnover had reached an "extremely dangerous" point. Mr. Corson pointed out that 23 men, serving on the average less than two and a half years, had served in eight key national security posts since 1953. Previous administrations have had a somewhat similar experience. Mr. Folsom quoted a recent study covering several hundred businessmen who had served in government and left: 48 per cent served only one year or less, only 33 per cent served over two years.

Yet there is increasing evidence that it takes from one to two years for an able man, without prior relevant experience, to begin to pay dividends to the government in a new job. This is especially true in the National security field where the complexities of decision-making have progressed geometrically in recent years.

4. The so-called conflict of interest laws, passed many years ago to bar dual allegiance to governmental and private interests, are out of step with the economic realities of the twentieth century. They also run counter to the government's needs for talent.

Crawford Greenewalt, the president of du Pont, told us: "I do not think that you can legislate probity under any circumstances. A man is honest or he is not honest. If he is going to be dishonest, the mere fact that you make him sell his stock and cancel out his pension rights will not stop him."

The truth is we cannot expect men to give up stock options, pension plans and other benefits to accept federal posts. These security-oriented arrangements now provide the basis for long-range economic planning for millions of Americans.

The conflict of interest laws hamper our efforts to utilize able men in more than one way. As the laws now stand, for example, a large law firm might have to give up its entire tax or antitrust practice for one partner to serve as a government consultant. For this reason, able lawyers in New York could not accept service as consultants to the State Department, as members of the Fine Arts Commission or the National Advisory Council on Mental Health. These are typical cases in which outmoded statutes work to deprive the government of talents it might have.

5. The so-called dual compensation laws constitute another case where ancient statutes hamstring our search for special skills and experience. Let me illustrate with the example of an able military officer, highly trained at government expense over a period of twenty years. He has technical knowledge and ample administrative, diplomatic and general leadership experience. Under our present system, he retires in his late forties or early fifties. There are many posts throughout government where he could continue to make an important contribution. But the dual compensation law says he cannot draw both his pension, which he has already earned, and a government salary where the combined amount exceeds $10,000. So he will take his skills and experience outside the government to work for the same industries and research firms whose services the government eagerly seeks. "Why," the chairman of the Civil Service Commission asked us, "should we deny ourselves of their services and deny them another career . . . when they still have twenty years of useful life ahead of them? I think it makes no sense at all."

6. We have encountered extreme difficulties in recruiting able young men in their late thirties or early forties, yet this is the very group which can bring to Washington the drive and imagination we need. The

men in this group may be at a critical point on the ladder of success, on the verge of the vice-presidency or the partnership they have long sought. They also have heavy financial responsibilities with children to educate and homes to pay for. The prospect of trading their pay checks and fringe benefits for the insecurity and inadequate compensation of government service is not a happy one. Even more significant is the fear of losing vital promotional opportunities during their absence.

With this group, as with others, we have failed to convince them of the genuine needs for their talents, of the demands of the cold war, of the challenge and opportunities of government service. If they are good enough for us to want them, they probably hold important and challenging positions in private life. They are not easily convinced that they are wanted and can make a real contribution in a top government post. Therefore, as Mr. Boeschenstein put it: "We find ourselves time and again looking to older and retired men, whose experience is adequate but whose vigor and imagination are not always up to the demands of a tough federal job."

In discussing these problems, we cannot minimize the enormous task faced by our Presidents in organizing our national security efforts.

Picture a company with some three million employees strung around the globe. Picture a company with an annual budget of more than $50 billion. Picture a resourceful competitor whose every move is uncertain. Picture countless decisions—technical, intricate decisions—which must be made without full knowledge of the facts. Picture, not four or five intra-company committees, but thousands. Think not of trying to recruit three or four key executives, but literally hundreds. Imagine, not trying to weave two or three corporate divisions or plants into an effective team, but scores of departments and agencies.

This may give you some idea of the kind of job the President has. But just imagine how much harder it must be when chief lieutenants come and go. When they approach their jobs with little knowledge of the intricate problems involved. When he is foreclosed by law from tapping large reservoirs of talent to help him. When he is faced on all sides by a state of mind which regards government service as a chore and burden, not a duty and a challenge.

We are not dealing here with some academic exercise in public administration. As one of our first witnesses put it: "The stakes which are at issue in the effective operation of government today are no longer stakes of convenience. They are stakes of survival."

So I suggest that Congress and the Executive Branch must recognize the paramount needs of government for the finest talent we can find. Congress, on its part, must act to reform or repeal the archaic conflict of interest and dual compensation laws. It must act, in conjunction with the Executive, to establish an orderly procedure to catalog and utilize our human resources. It must deal in an honest and realistic way with the problem of low salaries. It must serve notice that it will be reluctant to confirm inexperienced appointees who do not indicate a desire to remain in office long enough to give the kind of service the country has a right to expect.

The Executive Branch, on its part, must provide the strong and dynamic leadership which will, in itself, help to attract men of talent. It must create a climate of challenge and opportunity. It must create a clear public understanding of the awesome nature of this contest we have not sought, but cannot afford to lose.

Beyond this, both Congress and the Executive Branch must strive to develop in this country a sense of duty and of obligation to serve in the finest traditions of our founding fathers, which far transcends personal considerations.

In time of an all-out, dramatic hot war, we have brought into government service every skill and talent we sought, regardless of existing attitudes and archaic, statutory impediments. In a cold war, the outcome of which can be just as final and conclusive, we must overcome these impediments by whatever action is called for, so we may call on talents which match our needs.

Having heard preliminary testimony from substantial and thoughtful citizens, I feel sure that the Subcommittee will recommend sweeping changes to accomplish this objective.

When our work is completed, I hope it will set the stage for a new and better climate of understanding in which outstanding men can enter public service, remain as long as required, and leave in the knowledge they have served well—without being pilloried and harassed by those few who would rather find a conflict of interest than try to serve the broad public interest, which is nothing more or less than our national survival.

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COMMENTS BY THE EDITOR ON

W. J. Baird, Editor

Air Force command and control depends upon the full cycle of communications and electronics for its defense, tactical and strategic forces. This dependence also includes the detection of an enemy, collation and analysis of pertinent data, alerting the global forces which must respond immediately, plus the maintenance and logistic support of those forces, and the launching of them — both the manned and unmanned — in counter action.

This is the job Air Force communications must do in a matter of seconds. How it is done will be told in the March issue of SIGNAL.

Treating in depth all phases of communications and electronics as an integral part of a modern-day weapons system, a thirty-page textual and pictorial presentation tells of the unbelievable strides made in the last decade. It tells of the threat facing the nation today from enemy ICBM and manned aircraft attacks, of time compressed into seconds to meet these threats. It tells of the people who make today's systems possible and what they see for the future when communication satellites become commonplace.

Look for:

- The concept and philosophy of USAF telecommunications including a brief history of weapons, flight, and associated communications leading to our present capability, the major elements of today's telecommunications systems, and how they relate to aerospace forces.
- An explanation of the various types of traffic which is passed over Air Force systems and the exact nature and purpose of this traffic—showing the capabilities of such networks as SACCOMNET, AIROPNET, COMLOGNET. Network functions will also be related to BMEWS, DEWLINE, SAGE, control of defense weapons and civil defense.
- Telecommunications in relation to counter force action concerning itself with the SAC alert for manned and unmanned systems, reflex action, and

THE SPECIAL AIR FORCE ISSUE

positive control of manned systems. Such items as SAC emergency communications and airborne command post will be covered.

- Tactical forces discussed to include forward control, alerting, mobile communications, deployment, and the ability to engage these forces in small or large conflicts.
- The interdependence of defensive and offensive forces and the relationship of communications to their mutual coordination and support.
- A review of the latest AF experiments in the field of missiles, satellites and spacecraft showing the importance of telecommunications for their support.
- An examination of human elements associated with communications operation of today—discussion of remote locations, 24-hour operation, skills training, and military-civilian relationships.

For the first time in several years, the complete story of Air Force communications-electronics—from the giant Ballistic Missile Early Warning System across the high arctic to the minute control mechanisms that guide and direct our weapon systems—will be told in the March issue of SIGNAL Magazine.

THE EDITOR

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Colonel W. J. Baird, Editor
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AIR FORCE ADVANCED AEROSPACE SYSTEMS OPERATIONS

by MAJOR GENERAL W. A. DAVIS, USAF
Commander, Aeronautical Systems Center

PRIOR TO MY PRESENT assignment I was located at Hq. AMC and was aware of the efforts which the Aeronautical Systems Center (ASC) had instituted in the advanced system area. It is my conviction that this is a most important and critical area. While considerable progress has been advanced, present plans call for an acceleration and expansion of these activities. My discussion will center around the traditional management functions of planning and decision-making. These two managerial functions are receiving increased emphasis and attention throughout the Air Force.

During the past decade revolutionary new developments of tremendous importance have been achieved and have changed the form and character of war. The continued worldwide dominance of American aerospace power depends largely on how quickly and how successfully we translate advanced system concepts into effective weapons. For this reason the evaluation, selection, and programming of advanced systems is of tremendous importance to the future of our national defense.

When we speak of advanced systems programs we naturally think in terms of research and development. An awareness of the current state-of-the-art in all technical fields of endeavor, coupled with an understanding of the threats which confront the nation and the tasks which have been assigned to the Air Force, provides a unique and comprehensive background against which the Air Force technical specialists can measure the relative merits of the proposals and suggestions advanced to satisfy Air Force requirements. This technical evaluation and soul-searching is a fundamental responsibilty for the technical elements of the Air Force. Air Force elements and industry generate a staggering number of new weapon ideas. Good management demands that those ideas having little or no potential value, be eliminated.

We recognize logistics aspects must also be given thorough and searching evaluation in preparing for advanced systems. We may receive a proposal for an almost perfect weapon system from a technical point of view, but if it cannot be produced or supported or if the dollars available to us will not permit its timely and economical procurement, that system cannot be added to our inventory, and should be dropped from consideration before sizable effort and dollar expenditures are made. I do not wish to imply that the technological considerations are becoming less important in future weapon system planning and selection. These factors have been and will continue to be predominant in the final decision to proceed with development of new weapon systems. Nonetheless, we must match the technical work with a corresponding analysis and evaluation in the functional areas of producibility, logistic supportability, and budget estimating.

All of us in the Air Force are painfully aware of the F-108 termination, the B-70 curtailment and other projects of the recent past such as the Navaho program, the F-107, F-103, the Goose and others which have diluted our resources and manpower energy without contributing to the Air Force objective of deterrent capability *in being*. There are many reasons for terminating programs, for cutbacks in production quantities, and for abandonment of research efforts. One fundamental reason has been a failure to provide the decision makers with true estimates of the eventual program cost. Consequently, while we had enough dollars to kick the projects off, the requirements in subsequent fiscal years reached proportions that could not be supported. The important and costly areas of logistic support, producibility, and maintainability, as well as the scheduling and programming have gotten only a cursory examination in the past. Our contribution to advanced systems programs up until recently has been primarily that of contracting for industry studies. Of course there has been a growing recognition of the need for more consideration of logistics elements in evaluating future AF systems.

Let us take a moment at this point to talk briefly about the dollar problem. Dollar limitations have long been a major hurdle to overcome in trying to do all the things we would like to do in the Air Force. But today, more than ever before, the dollar has become the dominant factor in dictating our capability. Everything costs more now and we can assume that this trend will continue. I bring these points out to illustrate the extreme importance of our efforts in system evaluation. We just simply cannot afford to dissipate our scarce dollar resources on systems that cannot reach fruition. We must be constantly alert to the impact of those systems that we do select for development in terms of *total* program cost.

Against this background we have responded to the challenge and moved ahead in an effort to perform our responsibilities in the advanced systems area more effectively by establishing an organization within ASC to deal with the logistics aspects of advanced system programs. In order to insure immediate effectiveness, this new organization has been staffed by some of our key management people, and our best technical talent.

The weapon systems currently in development and production represent the tremendous advances of the past decade. These systems are the backbone of today's and tomorrow's Air Force and must be given our best management attention. However, we must also prepare for the day after tomorrow and do a better job of evaluating and planning for the advanced systems of the future. In recognition of this challenge we must make our determinations regarding future weapon systems with full consideration of logistics feasibility along with the technical aspects of our research and development efforts.

What do I mean—logistics feasibility? More and more this term is being used throughout the Air Force and industry to sum up the many materiel and other functions which support weapon systems. These functions determine the operational success of a weapon system program. Logistics feasibility includes the following:

1. Producibility—Is it feasible to plan production of a new system within existing or obtainable capabilities

of the industry within the time required?

2. Cost Estimating—We must estimate research, development, production, maintenance and operating costs to determine if the total program cost can be supported from anticipated appropriations considering the relative priority of all other systems being considered.

3. Manufacturing Technology—We must insure that the state of the art for manufacturing processes to produce, shape, and assemble new and exotic materials will be available in the time period planned for production of a new system.

4. Maintainability—We must evaluate our current maintenance concepts against planned maintenance requirements for new systems to insure that maximum reliability and repairability are achieved.

5. Materiel Support—The requirements for ground support equipment, spares and spare parts, our methods of warehousing, transporting and computing support requirements must all be carefully examined, and a definite plan must be established for materiel support of any new system being considered if we are to achieve the ultimate success conceived by the scientists and engineers in their design of these aerospace systems of the future.

Logistics feasibility as just described depends of course on design. We certainly can't produce, support, maintain or even estimate the cost of aerospace systems that have not been designed. I well remember programs which we tried to launch into production too soon, before design had really been firmed up, and encountered only expensive and extensive delays and later costly retrofit programs. General LeMay, in a speech recently, summed up the impact of improper planning. He said that you can slip the completion of development and the introduction of a new system into the inventory, but you can't slip its obsolescence date. As he said, the result of slippages in development and production mean only that the useful life of the system has been shortened.

Studies and Analyses

The recent evaluations of study requirements for a long-range interceptor, the STOL (Short Take-Off and Landing) Project, and the MATS (Military Air Transport Service) modernization program were among the first to include real consideration of logistics feasibility *in advance* of the issuance of a development directive. We are not completely satisfied with our efforts on these projects. However, we *do* feel that the product of our labors has considerably enhanced the realism and validity of the evaluations. We are sure that high level Air Force decision makers were given a much sounder basis on which to make their decisions on these potential programs. We are learning, but it will be some time before we reach the desired level of capability. As we analyze each advanced system program we make a little more progress in the development of techniques, procedures, ground rules, assumptions and experience (in other words *capability*) which has the desired effect of increasing the quality of our future efforts.

After hearing the MATS Transport Development Plan Presentation which was the result of a joint ASC/WADD (Aeronautical Systems Center/Wright Air Development Division) in-house study, one member of the Weapons Board of the Air Staff in Washington stated "It was refreshing to see a schedule presented that was not overly optimistic; too many times we are given optimistic schedules and the only defense for such schedules has been that we are better than we used to be. I particularly like the historical comparisons with other programs we are seeing here."

Recent experience with Hq USAF reaffirm the course of action we are now pursuing on advanced systems analysis. These experiences clearly demonstrate that the Air Force must be in a more defensible position on future system programs. It has become obvious that higher levels of the Department of Defense with whom final decision making authority rests will not be satisfied with, nor will they accept the broad brush approach of past years. We must be prepared to substantiate our projections and estimates in depth through more comprehensive and searching evaluations. This trend was indicated clearly in two recent major system programs which were released only on a conditional basis. We were required to re-study and re-evaluate alternate solutions to the system problem and to present our findings in detail before securing full release of these programs. The experience that we have gained from these two programs indicates that we in the Air Force must do a lot more analyzing and evaluating on a new weapon system approach before we reach the Source Selection Board stage. We must assure ourselves that we have a sound, logical and reasonable requirement before we ask industry to submit proposals. After we do this, we can reassure the people at Hq USAF and DOD that we are basing our recommendations on realistic evaluations of potential capabilities and costs. We must gain their confidence if we are to expect their approval and prompt release of new programs.

Thus far, with exceptions, we have had to confine our efforts, to study and analysis of complete weapon systems. We know that in many instances logistics feasibility should be given consideration in the study and analysis of potential subsystems and components for advanced systems. A recent Air Force Project Summary Document lists almost 800 projects being evaluated as to engineering and scientific feasibility. A review of these projects indicates that logistics aspects are important in over 200 of them, which will relate to Aeronautical Aerospace Systems. However, our present resources do not permit an adequate evaluation of this volume. You may be assured, however, that positive action is being taken to insure that logistics feasibility will in the near future be one of the primary considerations in determining whether to proceed with the development of new subsystems and complex components.

Our studies must be as comprehensive, accurate, and complete as we can make them. Neither optimism nor pessimism has any place in the studies and recommendations submitted to higher echelons. In other words, all our efforts must be objective in character, be based on the best information available, and reflect our best judgment. It is easy to say this but it is a lot more difficult to actually achieve this in practice.

From all that I have said, it is obvious that we are placing added emphasis on logistics feasibility consideration in advanced systems. We are all well aware that the research and development programs and logistics considerations are all entwined, and extremely difficult to separate and sort out into neat little piles. ASC in conjunction with WADD has recently completed several "in-house" advanced systems studies, and the success of this operation indicates that this will probably become our normal procedure in the future.

"In-House Studies"

What we have done, in connection with the STOL (short take-off and landing tactical fighter) analysis and the MATS cargo transport analysis, has been to

conduct an in-house study wherein Air Force engineers actually cooked up a preliminary design and a matching technical analysis of this preliminary design. In fact, a number of designs were made in each case and the most promising was selected for detailed analysis. Utilizing this most promising design, our logistics specialists generated a logistics concept, production schedules, reviewed the impact of these new aircraft on current industrial facilities, and developed over-all program costs. All this information was incorporated into a document referred to as a Development Plan. However these documents were more than development plans; they were *total program plans*. The development plan for the STOL is approximately 1½" thick. This entire plan was presented to the Weapons Board and to the Air Force Council, enabling them to make their decision to proceed, or drop this program on the basis of an in-house study and evaluation rather than having an industrial source selection provide a majority of this information. While I have no intention to criticize industry, most of us in the Air Force are aware that industry proposals, because of industry's eagerness to become a winner, are generally based on optimistic assumptions.

It is my belief that our new practice of conducting an "in-house study" prior to the initiation of an industry-wide source selection activity is of great benefit to both the Air Force and industry. I believe this is true because in addition to furnishing the Air Staff with a great deal more realistic information on which to base decisions, it enables us to better define to industry exactly what our requirements and desires are. It also eliminates to a large degree the possibility of starting the program and shortly thereafter slowing it down or terminating it because of some condition which was not taken into account initially.

Only after we have pieced together the entire procurement, production, logistic, and cost aspects of the system and have placed them in their proper perspective can a realistic appraisal be made by top Air Force echelons as to the future value of one advanced weapon system over another. If our studies meet the desired level of quality, then they will constitute a truly valuable contribution to the process of deciding which systems should be developed and added to the nation's aerospace strength.

Partial Answers

In conclusion I must say that we have only partial answers now. Undoubtedly we are going to have future changes and adjustments before we attain the efficiency we must have to discharge this mission in an optimum manner. The important thing is that we have recognized the need and urgency of the matter and have made a good start toward the goal. We are faced with ever increasing complexity, ever increasing costs, the ever increasing job of selection among the many breakthroughs in technology. We must stay abreast of the multitude of ideas and concepts generated by industry. We dare not lose sight of the need to meet the ever increasing threat of our potential enemy. All these factors dictate that we must expand our capability to provide the basis for the Air Force to make wise and sound decisions before starting future weapon system programs.

As with all new endeavors, effectiveness will become a function of experience. In its initial two years of life the Aeronautical Systems Center has brought into focus a vital and compelling managerial problem. In the next two years the Center will develop methodology, experience and results.

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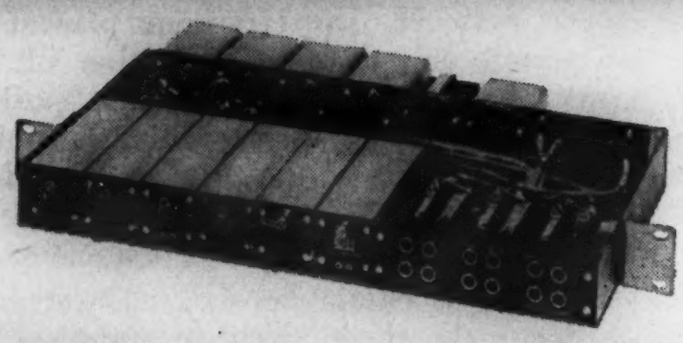

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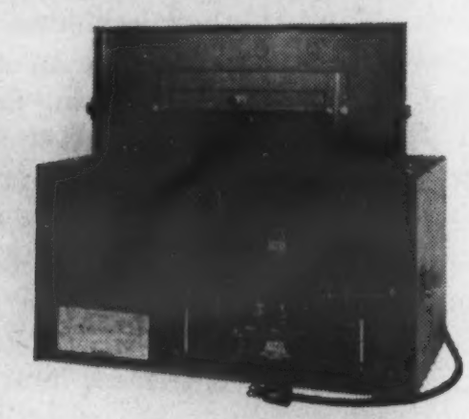

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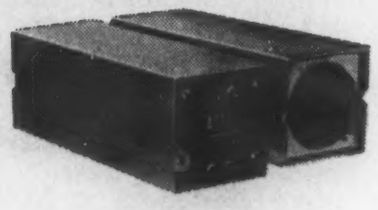

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Big Business in the Military

This is the first in a series of articles which SIGNAL *will publish on defense supply management. The material is being made available by The Honorable Courtney Johnson, Asst. Sec. of the Army (Logistics).*

OF AMERICA'S ANNUAL 40 billion dollar defense budget, 25 billion dollars is spent each year in contracts for equipment, material and services including research and development of weapons systems.

These 25 billion defense dollars spent in industry contracts are three times the combined purchasing volume of General Electric, General Motors and United States Steel.

Below is the approximate amount which the Department of Defense spends currently in each broad category:

	Billion Dollars
Aircraft, Ships, Missiles & Ammunition	9.8
Electronics & Communications Equipment	1.8
Petroleum and other Fuels	1.0
Food and Clothing	.7
Construction	1.4
Experimental, Developmental Test & Research Work	5.2
All Services and all other Procurement including that within the Government	5.1

Generally, all Defense purchases are made by one of two ways: through "negotiated" or "advertised" contracts. At present, approximately 86% of all procurement dollars are obligated through "negotiated" contracts. There is much misunderstanding from the public of this kind of purchasing.

A leading congressman made the comment, "Why is it such a percent of Defense spending must be accomplished this way? My State government can buy all of its requirements with sealed bids." He declared, "Why can't the military do the same thing?"

The congressman had a point which appears valid on the surface. A respected finance periodical answered his question by saying, "It is less burdensome to 'negotiate' with two or three companies than to do business on the open market."

This is misleading. The Department of Defense buys everything that state and local governments buy, in the same manner, by advertising for sealed bids. DOD purchases everything from rubber bands and typewriters to water canteens and automobiles this way. This is the less burdensome method. At a designated time the bids are opened and the contract is awarded to the lowest bidder.

However, Department of Defense requirements go far beyond rubber bands and automobiles. For example, as the spending figures show, DOD has annual requirements for 10 billion dollars in aircraft, ships, missiles and ammunition alone. The technical knowledge and industrial capability to produce advanced weapons is limited, and it would serve no purpose to publicly advertise for sealed bids to make weapons not yet designed. When missiles to be launched from under water were first proposed, there were of course no such missiles.

First, the missile system had to be designed. It is not an easy task to design a 28-foot-tall missile weighing about 30,000 pounds to be pushed through 90 feet of water, then ignited, and set on course to hit a target 1,000 miles away. Every missile and missile system in America's present arsenal has similarly been designed from ideas to finished products. There is intense competition among industry in these "negotiated" contracts, contrary to popular belief. This competition takes form in price and design of the proposals from industry.

Another example is the Army's Mauler guided missile system. Ninety-seven industrial concerns had representatives attend a briefing at Redstone Arsenal in Alabama. The representatives were given a description of the current threat, against which the DOD required a missile system to counteract. An invitation to bid on a feasibility study contract was made to those attending the briefing.

Thirty-one manufacturers submitted competitive proposals, or bids, and these proposals underwent extensive evaluation. Independent consultants were called in—well known, recognized experts in the various fields of scientific and engineering design.

Finally, four companies were selected for feasibility study contracts. Six month contracts at $50,000 each were awarded. When these study contracts were fulfilled, the results were subjected to a technical evaluation, an operations effectiveness evaluation and a facilities evaluation.

On the recommendation of these evaluation groups a system development contractor was proposed and approved.

Necessary funds were released by the Bureau of the Budget. Negotiations with the selected contractor began within a matter of a day or two.

At this point the direct competition ended. 97 firms had been invited; 31 submitted proposals; 4 were selected for the "finals"—1 of the 4 was eventually given the big contract. Negotiations with the selected contractor were concerned with over-all price and time involved in the contract work. Further, once that manufacturer develops his contracted missile system, the Army will award the production contract to him also. It would be illogical to have one manufacturer develop a system using his plant's men and machinery, at government expense, and then award the production contract to a second manufacturer. It is usually most economical for the Defense Department to award the follow-on procurement contract to the same manufacturer.

Mauler is an example of negotiated contract competition in design. Other negotiated contract situations find manufacturers competing with one another in price, or in a combination of design and price. Recently the three Services sampled their negotiated contract statistics and found that an overwhelming 88% of all procurement in Fiscal Year 1959 was awarded after price or design competition among the prospective industrial firms.

Negotiated contracts, where the Department of Defense has a continuing voice in the progress of the contracted work, embrace the concepts of healthy economic competition. Negotiated contracting draws from the practical experience of U. S. industry and at the same time passes on to manufacturers lessons of solid business practice from the vast government pool of knowledge in every area from cost accounting to packaging design.

SIGNAL CORPS' ROLE in a CENTURY of R&D

by DR. GEORGE RAYNOR THOMPSON—Chief—Signal Corps Historical Division

SYNOPSIS: *Part 1, which was carried in December, discussed early Signal Corps history highlighted by such accomplishments as Civil War use of visual flags and torches, the magnetoelectric telegraph set and the Study Room—an effort in research and applied science.*

PART II

General Myer's successor was Brigadier General William B. Hazen, who had served in the Infantry in the Civil War with distinction. He now took over the Signal Corps, with its peculiarly specialized, rather unmilitary weather service, with remarkable understanding. Reorganizing his office in 1881, he established on 27 January of that year the Scientific and Study Division in the OCSigO "for the purpose of scientific research and investigation into the laws of meteorology." Out of this grew the so-called "Study Room," under an internationally known meteorologist, Professor Cleveland Abbe. General Hazen added a small civilian staff to assist Abbe in the investigation of meteorological problems. He outfitted a laboratory for developing and testing weather instruments. He improved the competence of his enlisted men by permitting the enlistment of qualified youths, mostly college graduates, as sergeants in the Corps with exemption from many of the ordinary duties of regularly enlisted soldiers. These were far-sighted measures, decidedly novel in the Army at that time. Thus, General Hazen promoted the scientific trend which Myer had begun in the Signal Corps.

These forward looking actions were not made without friction. There were sharp complaints from other government offices and from Congress about Professor Abbe's salary which was, for a while, second highest in the entire government civilian employment ($4,500.00 a year). Only Joseph Henry, head of the Smithsonian Institution, received more, $5,000.00. And there were internal troubles, too. For example, the civilian researchers in the Study Room complained of such unsympathetic orders from their officer commanders as the following:

> You will begin on Monday next an investigation of the causes of gravitation, and make a preliminary report in two weeks. A final report is to be ready by the first of next month.

Again, the good Professor Abbe thought it unsympathetic, in fact downright unreasonable, that, on receiving the job of writing a sound and scholarly textbook on meteorology, he should be expected to grind out without fail a fixed number of pages in a given time.

But, if junior officers in the Corps tended to regard scientific researches and reports quite the same as routine military schedules, to be wrapped up regardless and delivered on a deadline, the Chief himself took a broader, wiser view. For example, he reported in his Annual Report of 1887, "Professor Abbe has been relieved by the present Chief Signal Officer from any routine work, so that he might apply himself to scientific research." (This was Greely reporting, Hazen having died early in 1887.) Actually, the half dozen scientists in the Study Room turned out an immense amount of work by any standard in the 1880's. They definitely put into business the weather service of the Corps, laying a firm foundation for the subsequent U. S. Weather Bureau. And they definitely set the Signal Corps itself on a course of research and development, destined to grow into ever greater significance.

It is interesting to know something of the research efforts of the Study Room. They included the testing and development of weather instruments, especially self recording types; studies of solar radiation; studies of atmospheric electricity; studies toward a system of standard time and prime meridians. The adoption of standard time zones in the 1880's in this country and abroad was greatly promoted by the Signal Corps during the period of its weather service.

The Signal Corps Research & Development is still profiting from these efforts of the Study Room so long ago. I recently noted a news item in the Ft. Huachuca newspaper, *The Huachuca Scout* dated 28 April 1960 which reported that a civilian meteorologist in the Meteorological Dept., G. E. Daniels, has succeeded in developing a superior type of thermometer (thermocouple) which the Signal Corps is now getting patented.

What led Mr. Daniels to the theory and formula which he worked out and which are basic to his new development? The newspaper article states that his curiosity and interest in the subject were aroused a few years ago by his reading in the 1887 CSigO Annual Report an exhaustive 100-page study on the "Measurement of Atmospheric Temperatures." That study was a part of Abbe's meteorological writings which the wisdom of Generals Hazen and Greely permitted to be accomplished in a scholarly manner nearly 85 years ago in the Study Room. It was published as an appendix to the 1887 CSigO Annual

Early Signal Corps officers

Report. It was a piece of hard research in the 1880's which has thus borne fruit in this Centennial Year 1960, thanks to Signal Corps nurture of research in the Army both then and now.

General Hazen was the first Chief Signal Officer to inaugurate the practices, now so familiar, of seeking the help and advice of "consulting specialists," as he called them. One such was the prominent physicist, Samuel P. Langley, later head of the Smithsonian Institution. Hazen sought him out to promote the investigation of solar radiation. Langley developed the bolometer (or precise thermic balance) and in 1881 he led an expedition up Mt. Whitney, highest point in the continental U. S., in order to make effective studies of solar radiation. Two other prominent physicists whom Hazen made consulting specialists to the Corps were Professor Henry Rowland of Johns Hopkins and Professor John Trowbridge of Harvard.

First International Polar Year

It was under General Hazen that the Corps carried out America's first venture in large-scale international scientific cooperation. I refer to the first International Polar Year, as it was called at the time. Two Signal Corps expeditions went out in 1881, one to Alaska, the other to Ellesmere Island, near Greenland. Both completed their missions. But the second did so at a great sacrifice. Lieutenant A. W. Greely, charged with a 25-man party to Ellesmere Island, was rescued belatedly in 1884 with five survivors, more dead than alive from starvation that took the lives of all the others. Yet the men had kept scientific records and made periodic observations up to within the last 48 hours before the rescue. The records were all brought back for study and correlation with data collected by the dozen other nations that had cooperated with the United States in this first IGY.

Lieutenant Greely's physical condition was such that he would have had to retire from the Army, Hazen wrote in his 1885 report, but for vigorous action by Hazen himself, getting Greely appointed as his assistant. Two years later, on Hazen's death in office, Greely, then a captain, was uplifted in an extraordinary jump to brigadier general and was appointed Chief Signal Officer in 1887. Incidentally, far from dying early from his Arctic ordeal, Greely carried on as Chief Signal Officer for 19 years (to 1906), lived on to age 91, and received in his last year, 1935, the Medal of Honor for a lifetime of remarkable service to the nation. "Ordeal in the Artic," by the way, was the title of an article on the Greely expedition in the June 1960 issue of the magazine *American Heritage*. The author, A. L. Todd, is also publishing a book on the expedition, to be entitled *Abandoned*. It will appear in the next few months.

General Greely, by the strength of his personality and fame, and by dint of extreme devotion and labor, kept the Corps in being during some very lean years in the Army prior to the Spanish-American War, after the loss in 1891 of the weather service. This Signal Corps mainstay was transferred out of the Corps by Congress to the Department of Agriculture because meteorology was a civilian concern, not a military one.

Greely promoted many scientific interests in the Signal Corps. I can only mention the telephone, photography, and aeronautics. Greely brought balloons back into the Army in 1892. It was through Greely that Congress and the War Department contracted with Samuel Langley for a power-driven airplane—a notable effort although it failed in 1903 only a few days before the Wrights attained success at Kitty Hawk.

A significant event occurred in the Spanish-American War. On 19 May 1898 at his desk in the Washington headquarters, General Greely learned that the Spanish Squadron under Admiral Cervera had entered the concealed harbor of Santiago de Cuba. This was vital information, at a time when our Navy and our east coast cities were desperate to know where the enemy's potentially dangerous fleet was, and to learn what its intentions might be.

How did the Signal Corps come by this valuable intelligence? The Signal Corps cable censor at Key West, Colonel James Allen, learned the news over the submarine cable from Havana. Allen enciphered the information and wired it at once to his chief in the War Department headquarters. Navy heads in Washington could scarcely believe that Greely did know for a fact the naval intelligence he was relating to them.

This was a first in that darkly veiled activity which has always and inevitably accompanied the provision and operation of Army communications. I refer of course to the intelligence potentiality and activity, which is a Siamese twin of military signals. Greely was always intensely aware of the value of this potential use, so much so that he preferred to speak of Army circuits not as communication

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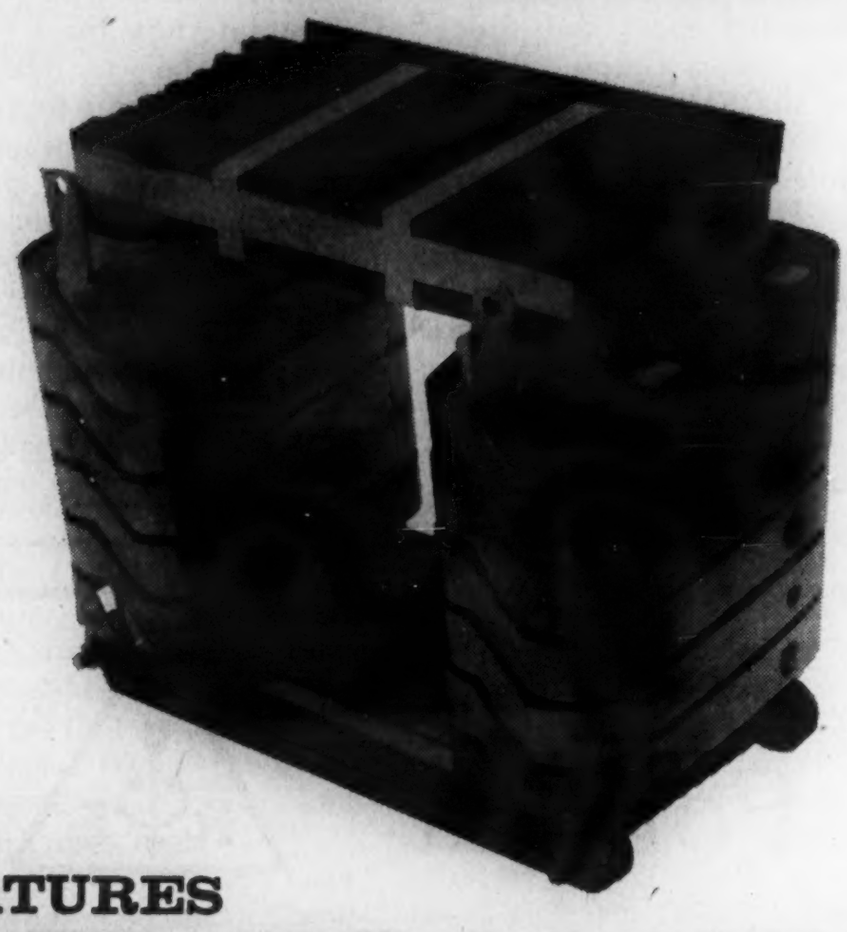

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lines but as lines of information.

After the Spanish-American War, General Greely put the Signal Corps into long-range wire and cable business overseas in Cuba, Puerto Rico, the Philippines and in Alaska, where a young Signal Corps lieutenant and firebrand named Billy Mitchell erected many miles of Alaska's first wire lines. Also in Alaska Greely supervised the installation of Army's first regular radio circuit in 1903—a spark telegraph link which spanned the 110 miles of Norton Sound to join outlying Nome with the wire circuits at Ft. St. Michael.

Thus, at the outset of the 20th Century, radio came to the Signal Corps. The Corps in turn did much to promote and direct this new development, a development in which George O. Squier would play a large part. Yet for a while early in this century Squier seemed more likely to make his mark in aviation (as did indeed numbers of Signal Corps officers, e.g., Billy Mitchell, Hap Arnold, Lahm and Foulois). For it was Major Squier who in 1907 drew up the specifications for Army's first airplane, the Wright Flyer.

At Fort Myer in Arlington you will see a marble stone serving as adjutant's stand, along side the reviewing stand on the parade ground. The Signal Corps placed that stone there 3 September 1958 dedicating it with joint Army-Air Force ceremonies on the 50th Anniversary of the first flight of an airplane on an Army installation.

To return to radio the Army's first sets were of course spark-type radiotelegraph. But the airplane and its communication needs greatly stimulated the development of radiotelephone. Signal Corps officers, notably General Joseph O. Mauborgne when he was a major around 1912, did some pioneer work in air-ground radiotelegraph. Then, during World War I, General Squier as the Chief Signal Officer greatly forwarded radio development in the Army, a development which in turn tremendously contributed to the radio industry in America from 1920 on.

Squier, a Ph.D. in electrical communication, as well as a graduate of West Point, was an unusual officer, of unusual vision. He understood the technical needs of the nation before World War I. In 1916 he predicted to the National Academy of Science that "the United States will probably find it desirable to appoint as a Cabinet officer a Secretary of Science in the not distant future," a prophecy not yet fulfilled, but likely to be.

(*Continued on page* 42)

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NEW CLARITY — NEW SHARPNESS . . . with copy feed rolls precisely positioning surface of the map on the flat copy scanner table, exact focal lengths are maintained for clear, sharp recordings. Focus smudge caused by unusually thick copy or copy lifting from drum is *completely eliminated.*

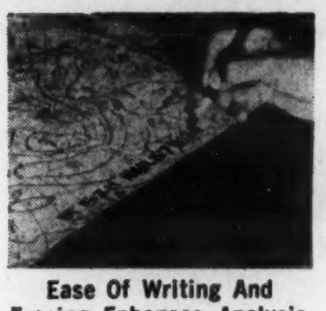
MEETS ALL FUTURE REQUIREMENTS . . . the practical scanning equipment for a world-wide facsimile map network. Speeds can be easily increased — without reengineering of equipment — for use with coaxial or microwave transmission facilities and computer-processed weather data.

WHAT ARE YOUR FACSIMILE REQUIREMENTS? LET'S GET TOGETHER . . . Alden Flat Copy Scanners and Recorders are available in all sizes (and up to 30 times present network speed) to users and qualified manufacturers. Your inquiry is invited.

HERE'S WHY FORECASTERS PREFER* ALDEN RECORDERS AND ALFAX MAPS AND WHY WE THINK YOU'LL LIKE THEM TOO!

MOST COMMENDED FEATURES OF ALFAX MAPS

Color Is Easiest To Read Under All Lighting Conditions



Ease Of Writing And Erasing Enhances Analysis

Clean Crisp Duplicates By Bruning Or Ozalid

PLUS THESE UNIQUE FEATURES

LOW COST . . . Alfax papers save ⅓ to ⅔ yearly paper costs.

CLEAN . . . Electricity is the Ink . . . ion deposits make crisp brown marks on clean white background — free from dust, smudge and chemical irritants.

PERMANENCE . . . Alfax stores indefinitely . . . recording marks are permanent.

* In surveys of weather forecasters experienced with all weather facsimile systems, 3 out of 4 indicated a marked preference for Alden Recorders and Altax Maps.

MOST COMMENDED FEATURES OF ALDEN RECORDERS

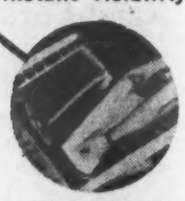
EASE OF INSTALLATION
Compact, mobile, and ready for immediate operation.

Uncrate

Roll in

EASE OF OPERATION
A new high in clean, quiet, trouble-free operation

Instant Visibility



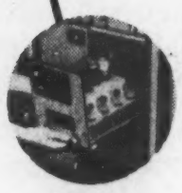
Easy Paper Loading

Automatic Time-Clock Programming

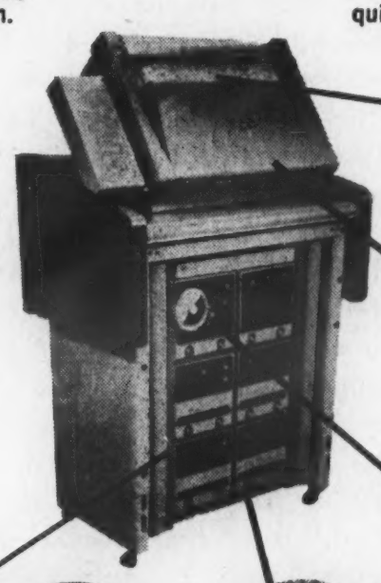
EASE OF MAINTENANCE

Front panel checks

Back connector checks



Plug-in construction



PLUS THESE UNIQUE FEATURES

SECURITY . . . Low voltage marking process does not generate a signal that can be intercepted.

HIGH SPEEDS . . . Sixty, 90 or 120 RPM operation — recorder technique and paper capable of 15 times these existing speeds.

VOLUME PRODUCTION . . . Designed for volume production on short lead time through unique expandable manufacturing processes.

CEILOMETER BREAKTHROUGH

Used with rotating beam ceilometer, Alfax paper and Alden recording techniques replace continuous live scope observation with a continuous pictorial history of cloud conditions. Dynamic tone-shade gradients in warm color reveal all pertinent ceiling information in easy-to-read, easy-to-interpret form. Superimposed dark maximum signal marking shows exact reportable cloud height.

ALDEN ELECTRONIC AND IMPULSE RECORDING EQUIPMENT CO., INC.
Alden Research Center — **Westboro, Mass.**

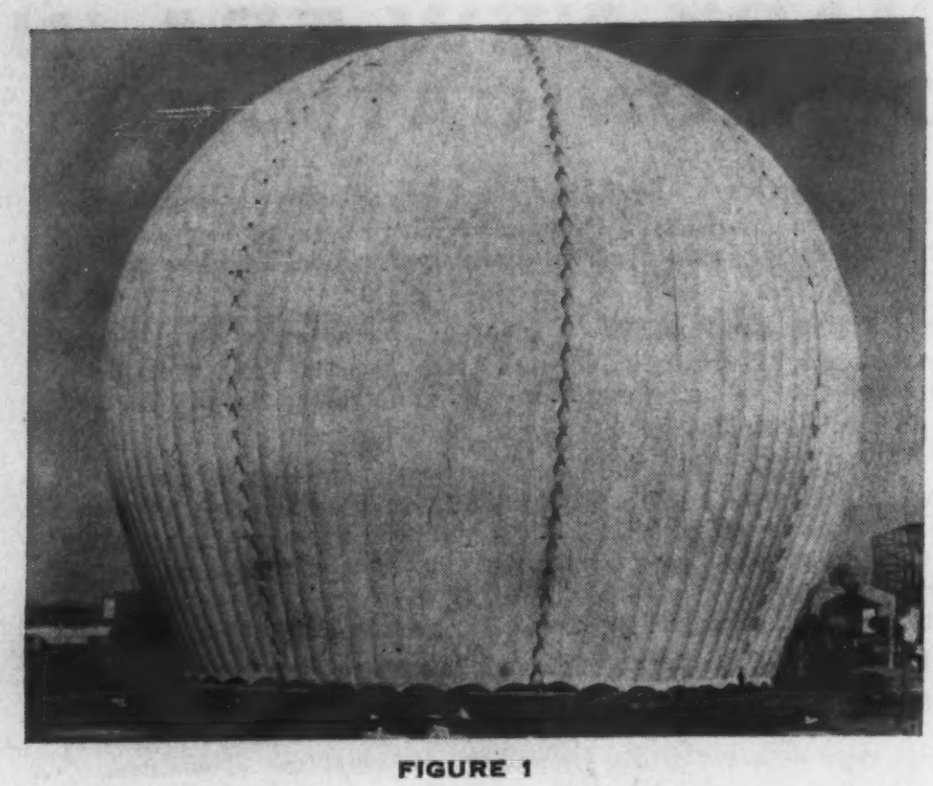


FIGURE 1

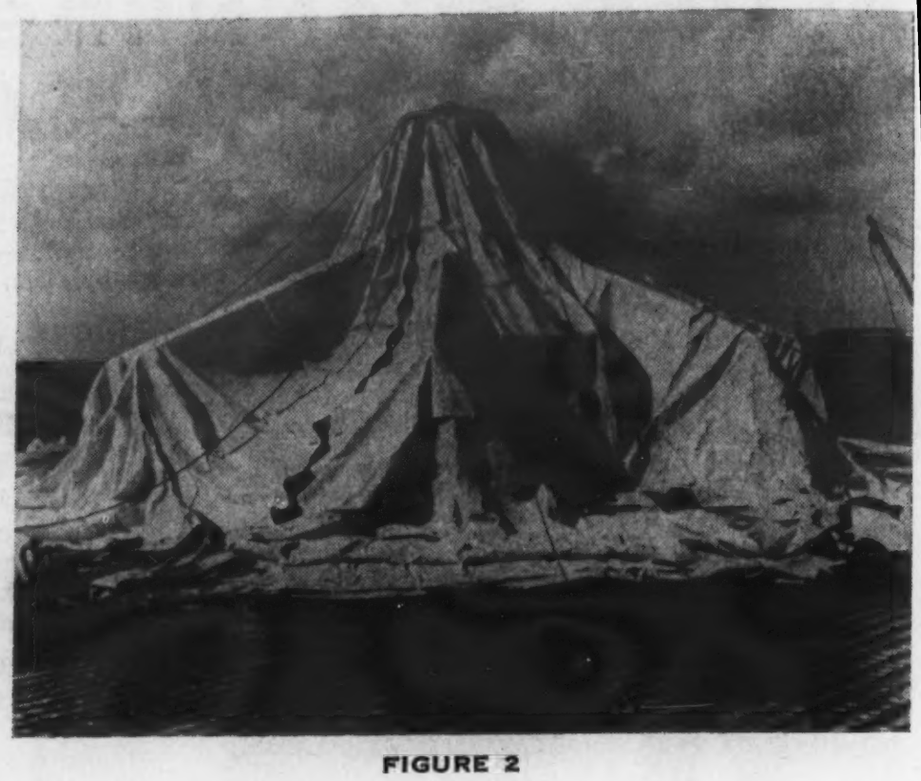


FIGURE 2

DUAL-WALLED RADOME

by **F. NIECHNIEDOWICZ**, Engineering Section Head for Mechanical Engineering Surface Armament Division, Sperry Gyroscope Company, Division of Sperry Rand Corporation and **W. BIRD**, Birdair Structures, Incorporated

The dual-wall radome discussed herein is used with Radar Set AN/MPS-21 and was developed for the U. S. Marine Corps under Bureau of Ships Contract NObsr-64229 by the Sperry Gyroscope Company, Division of Sperry Rand Corporation and Birdair Structures, Inc. Although this radome was developed specifically for use with the MPS-21 radar, field evaluations and tests have shown that its sound basic design and construction may offer many advantages for general purpose use.

Edwin C. Aiken
Colonel, U. S. Marine Corps
Code 675, Bureau of Ships
Navy Department

AT DIFFERENT LOCATIONS along the East Coast there has appeared recently a white, spherical radome, approximately 50 feet in diameter and 44 feet high. This radome housed the AN/MPS-21 long-range search and height-finding radar system developed by Sperry Gyroscope Company. A passing glance would lead one to think that this was a conventional inflated radome of single-wall construction. However, a quick inspection of the dome would establish that it is a radical departure from the conventional air inflated single-wall dome (see figure one). This radome is made in eight sections, each section having wide vertical corrugations. There is no ground site preparation, beyond driven cable anchors, and the eight sections are all secured to each other by means of quick lock fasteners on a vertical catenary cable. Inside the radome, the first things noticed are the absence of an entrance air lock, of any air hiss or blower noise, or the feeling of pressure. There is no pressure differential between inside the radome or outside.

The dual-wall radome design was developed for the U. S. Marine Corps by Sperry, a Division of Sperry Rand Corp., and Birdair Structures, Inc. Field tests and experience have verified the soundness of basic design and potential use of the radome for general purpose.

While the specifications for the AN/MPS-21 radar system were being formalized the question of housing, or not housing the radar, in a protective envelope was resolved. The radar requirements of compactness, easy knockdown, triphibious transportation (air, land, sea) and quick erection, were binding on the radome.

Conventional radomes did not meet these requirements. The new MPS-21 tactical radar system incorporates a number of unique characteristics. Not only is it the first such system of comparable size and weight to provide three-dimensional data, range, height and azimuth, at extreme ranges, but it employs an especially developed radome that has many applications where reliability, mobility and portability are imperative.

With a structural configuration of the radar system requiring an inside diameter of 44 feet and an inside height of 41 feet for the radome, the Marine Corps, Sperry and Birdair team went into action to develop a radome with the following parameters.

Radome Parameters	
Number of sections	8
Weight per section	375 lbs.
Weight of radome	3,000 lbs.
Weight of blowers and duct work	310 lbs.
Total weight of radome and all auxiliaries	3,505 lbs.
Volume of radome section (packed for transport)	52 feet^3
Number of catenary fasteners per section	37
Number of ground anchors	56
Number of gay cables	8
Erection time (minimum crew)	45 minutes
Erection crew (minimum)	6 men
Inside diameter (maximum)	44 feet
Inside height (maximum)	41 feet
Blower capacity (each of 2 blowers)	1,500 feet^3/min.
Blower horsepower (each of 2 blowers)	5 HP
Air pressure under average operating conditions	(10-20)" H_2O
Air pressure under extreme conditions	38" H_2O

The radome is constructed of 10 oz. per square yard, neoprene coated nylon for the inner envelope and webbing, and of 16 oz. per square yard neoprene coated nylon outside white hypalon painted for the outside wall. Cementing by conventional rubber bonding techniques is used throughout.

On the Site

There are two possible erection methods that can be used with this radome. The radome may go up first and the radar equipment erected and put into operation later, or the radar equipment may be erected first and put into operation and the radome put around it later. The environmental and tactical situation may determine which method is used.

The first method—radome up first and equipment later—gives the appearance of someone pulling up a pyramid tent by means of a 'sky hook' (see figure 2). Ground anchors and cable anchors are driven into the ground at premarked points as in the prior erection description. Radome sections are similarly laid out. The packaged radar equipment is placed inside the radome floor circle and the radome then completely fastened together, blower inputs attached, radome cap attached, and cables fastened in place. As soon as this is done, blowers are actuated and the radome rises into full operational position. The radar is erected and put into operation inside the radome.

A minimumly trained crew can put the radome into operation within an hour.

The second method—putting the equipment into operation and erecting the radome later—can be related to peeling a banana. Assuming we have a spherical banana, each 'peel' section is properly folded to make a neat flat package. If the peels were replaced around the banana, it can be pictured how the radome sections rise from the ground. First, the proper number of ground and cable anchors are driven into the ground in a premarked circle, at premarked points. The individual radome sections, properly prefolded and packaged, are put into their proper sector at the ground anchor circle. The lower part of the radome is clipped or attached to the proper ground anchors. The air duct 'octopus' is attached to the radome sections and to the blower manifold. Catenary cables from the ground to the radome, at approximately midpoint, are clipped together. The radome now is ready for erection. The blowers are actuated, and it starts to rise slowly, then more rapidly, and finally falls quickly into position. The time 6 men consume from 'blower on' to radome up is twenty minutes.

The final step remaining is the catenary fastening, and the attachment of guy cables.

This method of radome erection furnishes the option of putting the radar into operation on an emergency basis by minimizing the erection of all of the radar components at once. (i.e., The basic radar can be on the air first, radome and auxiliaries, later.)

Reactions

What did this radome provide for in enhancement and improvement of radar system operation?

Erection of the radar can take place in a sheltered atmosphere, out of rain, wind, and temperature extremes. All components of the system are of lesser size and weight because of less strenuous environment and shielding from forces of wind, ice, etc.

Better system operation and stability are provided by the uniform environmental conditions in the radome.

There is no volume penalty in transportability of the radar system. The environmental shielding permitted a less bulky structure which more than offset the gain in volume with the radome.

For a total of 3,505 lbs. of radome and necessary ancillaries, a system weight reduction of two tons (above radome weight gain) is accomplished. This means that 4,000 lbs. more of logistics can be brought in as opposed to a 'no radome' concept.

Operational Advantages

The use of this type of radome provides additional areas of improvement in over-all radar system operation. Most of these improvements are in the area of more uniform climatic conditions. During extreme cold and high wind, the radome provides a sheltered atmosphere. The dual-wall acts as an insulating barrier and the waste heat of the radar system can be retained in the radome as additional heat. During extreme heat, or desert conditions, the white outside envelope acts as a heat repellent, and the dual-wall construction again provides an insulating barrier. Fans can be provided for air movement inside the radome, if desired. Natural convection is provided by means of controllable openings of the radome cupola, or skylight. The excess heat, principally from the high power magnetron area, is ducted in or out of the radome.

The dual-walled radome design, briefly described, has been under evaluation test and operational use for a period of two years. It has gone through multiple assembly and disassembly by both contractor and Marine Corps service teams. It also has successfully withstood three hurricanes.

SigC Role (*Cont. from p. 38*)

Squier knew that the typical shoestring R&D operations of the Army and the Signal Corps would not do in wartime, that such slender communications R&D as the Corps maintained in a small laboratory in Washington and in collaboration with the Bureau of Standards was not enough. He realized that the only hope of an adequate signal service in the shortest possible time for the Army at war lay in making use of the best men in the country who were already engaged in the telegraph, telephone and electrical industries.

Consequently, upon appointment as Chief Signal Officer early in 1917, Squier at once sought and obtained the services of such men as J. J. Carty, chief engineer of AT&T, Frank B. Jewett, chief engineer of Western Electric, C. P. Bruch, vice-president of Western Union, and many others. Cooperating to the hilt, the industries at once provided soldiers for the Signal Corps from among their employees who were already experienced, trained and ready to man effective Signal units for overseas service. Above all, scientists and research technicians were needed, and they also were made available from the universities, the communication companies and industries.

In turning to these sources of skills and manpower, General Squier was continuing in the 20th Century the example which Myer and Hazen had set earlier when they sought scientific and technical talent outside the Army. Squier went a step further when he commissioned some of these men directly into the Corps. Such an officer was Lieutenant Colonel Robert Millikan, a famous professor of physics since 1896, whom Squier placed in charge of the Air Service Science and Research Division. (Lt. Col. J. O. Mauborgne commanded the overall Signal Corps Engineering and Research Division.) The need, the demand to design and produce new radio, especially radiotelephones using the new mass-produced high-vacuum triode tubes, was very great, for Army aircraft in particular.

Another need which had been thought unmilitary in 1891 but which in 1917 suddenly appeared much required indeed for the air service was meteorology. The Army demanded that the Signal Corps provide such a service in France. Millikan steered General Squier to the Weather Bureau and to William Blair, who had taken his Ph.D. under Millikan in 1906 at the University of Chicago. General Squier at once commissioned Blair a major in the Corps and sent him overseas in September, 1917, to head up the Army's meteorology service in France. Incidentally, Blair's Ph.D. subject involved the properties of microwaves, and it was his deep understanding of the subject which would lead to the development of Army radar in the Signal Corps laboratories in the 1930's, principally under Chief Signal Officer Major General Joseph O. Mauborgne.

The flood of new equipment developments in World War I required lab facilities beyond anything hitherto. No one more fully appreciated these needs than did General Squier. He looked to the location of the large Signal Corps training encampment he had recently set up at Little Silver, N. J., as a suitable area for a lab devoted to development work.

The laboratory was built and manned in 1918. It was fully equipped, Squier commented in his 1919 Annual Report, for radio R&D work. He added that by 1919 this lab had grown to be one of the largest in the world.

In the same report General Squier made a number of comments as pertinent today as then which can teach us that World War II experience in signals, Korean experience, and post-Korean experience right up to this centennial milepost in the Corps history all repeat the experience of the Corps nearly 50 years ago.

For example, Squier wrote in his 1919 Annual Report, "scarcely a single piece of technical apparatus that was regarded as adequate at the beginning of the war is to be found in the Signal Corps equipment at the time of the signing of the Armistice." The very same statement could have been made in 1945 at VJ Day. It could be made again today. General Squier stated also that "an apparatus was hardly perfected before it was obsolete"—a circumstance that bedeviled radio production. How modern a statement, though it was made in World War I!

Squier wrote further in the same report, "in no branch of the military establishment is the need for continual research more necessary than in the Signal Corps of the modern Army." This statement is perhaps even more applicable now than when the Chief Signal Officer wrote it 41 years ago.

In conclusion I submit to you that the Signal Corps' history of one hundred years not only does great credit to the men who have led and manned the Corps, but also the lessons of these years of experience, this Century of Army Signals, can teach, guide and inspire us today and in the days to come.

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The result of complex challenges

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Defense Contracts

(*Continued from page 7*)

put into effect. The prediction of the then impending difficulties was borne out in virtually all of the initial negotiations in research and development costs under the new cost principles. In addition, many Department of Defense officials, who had not directly participated in the formulation of the new cost principles, have become quite apprehensive over the fact that the current provisions promise to reimburse defense contractors for these costs to a much larger extent than in the past. There has also been much discussion over the manner in which the analysis and evaluation of contractors' research and development costs, and the ensuing negotiation of reasonable amounts to be charged against Government business, was to be accomplished. One of the most difficult problems to solve was how could individual contracting officers competently evaluate these difficult, highly technical problems. A corollary problem was to determine a basis for a single integrated approach by the Government in instances where a contractor performed under contracts with more than one military department.

In an effort to meet these problems, Department of Defense Instruction 4105.52 was issued in June 1960, signed jointly by the Assistant Secretary of Defense for Supply and Logistics, Perkins McGuire and the Director, Defense Research and Engineering, Dr. Herbert York. This Instruction cites the provisions of ASPR 15-107 relating to advance understandings on particular cost items, and ASPR 15-205.35(h) which comments on the negotiation of a reasonable reimbursement for contractors' expenditures for independent research and development.

The Instruction establishes the Armed Services Research Specialists Committee. When requested by the negotiator representing the sponsoring military department, the Committee will review the independent research and development programs of defense contractors. The Committee is to determine whether adequate segregation exists between independent research and independent development programs. "The Committee shall report to the sponsoring department its findings and recommendations concerning the scientific factors considered to affect the basis or extent to which such research and such independent development relating to procurement within the product line of the contractor, should be supported by the Department of Defense. Where a contractor's normal course of business does not involve production work, the recommendations shall relate to the development work falling within the contractor's field of effort of Government research and development contracts."

The directive provides for the designation of one of the military departments (sponsoring department) to conduct negotiations on allowability of independent research and development costs where the charges to defense work are substantial and where more than one military department is involved.

Each of the Services has, or is in the process of issuing directives to implement this Instruction.

Industrial concerns in the communications, electronics and related fields are vividly aware of the tight competition for defense prime and subcontracts, and the close computations required for bids and quotations in order for a company to stand a chance of receiving the award. The portion of the contract price that is available for profit is often so small that the least impact of unanticipated costs may well throw an expected modest profit into a loss. There are various sources of unanticipated costs; I shall comment briefly on one—changes to contract terms.

Changes to Contract Terms

One of the most common causes of modification to contract terms is the requirement for changes in drawings, design of specifications by the Government. The need for frequent changes is understandable in the light of the character of the items purchased by the military departments. Many of them are entirely new; others are constantly in process of revision; some prove ineffective when subjected to field tests; some components of major items fail to assemble in the precise manner intended; sometimes Government devised specifications prove faulty or are not furnished; etc. There are also many other factors resulting in modifications to Government contracts: changes in methods of shipping or packing, changes in place of delivery, changes in delivery schedule, failure to supply Government-furnished-property as required by the contract, delays in supplying Government-furnished-property, changes involving extra work, and a whole host of others.

Under a fixed price contract, whether the price be firm or variable, the bid or negotiated price, obviously, did not contemplate any of these conditions. Accordingly, where the changes generate increased costs, appropriate recovery should be made from the Government. This point, of course, is widely and well understood. Our experience shows, however, that the techniques of securing full and fair price adjustments for the increased costs generated by the changes are not as well understood. We find, for example, that even such elementary requirements as knowledge of the contract, are overlooked. The standard Changes Clause requires that the contractor's claim for adjustment must be made within thirty days after notification of a change. Where the requirement for a change is first noticed by the contractor, the contracting officer should be advised immediately. Strict application of contractual terms could nullify a claim. Similarly, where the contractor and the contracting officer cannot agree upon the amount involved, and the contracting officer hands down a unilateral determination, a written appeal must be made within thirty days.

With regard to supporting a claim for increased costs, the importance of proper documentation cannot be overemphasized. We have seen too many cases where lack of memoranda, confirming letters, written appraisals from authoritative Government sources, complete files as to implications of changes, etc., ultimately weakened the contractor's position in asserting his claim. Even more important is the careful and comprehensive analysis and presentation of all of the costs generated by the changes.

All too frequently, the more obvious cost increases (direct material and direct labor) are calculated and presented whereas the less apparent, but sometimes very significant cost elements, are overlooked. These are some of the costs which may be involved in contract changes, and which are sometimes omitted: research, development and engineering salaries, materials, supplies, and applicable overhead; purchasing department costs, suppliers' termination charges; cost of material made obsolete by changes, plus the expense of segregating, removing, offering, diverting, disposing, etc.; direct labor costs incurred on obsolete materials, direct labor additionally required, plus all related manufacturing overhead, and cost of all tools, equipment and facilities made obsolete by the changes or additionally required; applicable general and administrative

expenses, including direct items where appropriate.

Special Costs

Over and above the specific cost elements mentioned above, there are certain special costs which some contractors omit, or submit in a manner which does not permit support and hence does not result in recovery. These costs arise particularly in instances of changes resulting in decreases in quantities or stretch-outs. In these circumstances, we often find that many categories of employees become temporarily idle and cannot be diverted, nor would it be prudent to release them. In addition, substantial costs are often incurred in terms of unabsorbed burden. Claims for unabsorbed burden, or the excess of overhead costs incurred over the amount that would have been experienced if the delays had not taken place, may be calculated in many ways. Where the method used is logical from a business and accounting viewpoint, and where it fairly measures the extent of excess overhead, it stands a chance of being accepted by the contracting officer or the Armed Services Board of Contract Appeals. One of the leading cases in this area, frequently cited as a precedent, was one in which this writer participated. After an unfavorable determination by the contracting officer, the claim was taken to the Armed Services Board of Contract Appeals with resulting substantial recovery to the contractor. This was the case of Carteret Work Uniforms, ASBCA No. 1647, and the techniques of computing excess overhead have since been cited by the Board as "The Carteret Method." In summary, this method involves the calculation of an overhead expense ration for a normal period of operations, a comparison of this ratio to that which obtained during the delay period, and the claim for the excess.

Another procedure, successful in an ASBCA case, is the "Allegheny Method," involved in the Allegheny Sports Wear Co., ASBCA No. 4163. In this method, the overhead ratio for the entire contract performance is compared with the ratio for the scheduled contract performance, adjusted to reflect the cost base that would have prevailed had the delay not occurred. The difference between the two ratios is applied to the bid estimate of the direct cost involved to compute the amount of excess overhead.

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Newest RFL Transistorized Series 2056

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for TELEMETERING and CONTROL APPLICATIONS

Plug-in Frequency Determining Components, Power Supplies, Transmitters and Receivers.
For Microwave, Telephone Line and Voice Carrier Applications.
Featuring Latest Design Based on Years of Field Experience.

Modern Design . . .
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The 2056 Series of Audio tones features modern design utilizing plug-in card construction and provides equipment at a very minimum in cost with a maximum number of channels in a given space. For example, 10 AM transmitters or receivers and a common power supply are mounted in a single 3½ x 19" frame. Each channel is conveniently terminated with a terminal strip at the rear of the frame. Output relays are mounted on a bracket attached underneath the main chassis frame, each relay being located directly under its respective channel.

The channel frequency determining components are also of the plug-in type and are mounted directly on the channel plug-in assembly in AM units, and adjacent to plug-in assemblies on FS units. This type of design, of course, keeps spare parts requirements to a minimum, since all plug-in cards are common to all frequencies.

The 2056 Series of AM tones were designed to meet low speed tone signalling and control requirements when low noise lines and inherently low noise communication circuits as provided by microwave and voice carrier equipments are available for transmission.

The 2056 Series of FS tones are used when ultimate reliability and high speed keying is required. They can be used in circuits which are inherently noisy and which are subject to fading conditions.

The FS tones are available with either TWO or THREE frequency outputs. The former being employed in normal signalling and control circuits, whereas the latter is used in two-function single channel applications such as RAISE-OFF-LOWER, FORWARD-OFF-REVERSE.

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HIGHLIGHTS of 1960

The twelve months of 1960 brought exciting discoveries and great progress in communications and electronics. Many noteworthy advances also were made in AFCEA. Some of these highlights of 1960, all of which were featured on the pages of SIGNAL Magazine, are recorded here.

January

Syracuse, N. Y. becomes 48th chapter. Santa Barbara chapter inaugurates program to interest high school students in science through "Project: Recruits for Science." First meeting of regional vice presidents held January 29 in Chicago. National Aeronautics and Space Administration announces plans to launch "Project Echo" in the Spring of 1960. Navy demonstration of the Communications Moon Relay via the moon between Cheltenham, Maryland and Hawaii.

February

Bell Telephone Laboratories begin construction of an experimental ground station for sending and receiving telephone messages by way of man-made satellites. Air Force jet sets world speed record flying at 1,216 m.p.h. Thomas S. Gates appointed Secretary of Defense. "Operation Skyhook" successful when two ten-million-cubic-foot balloons were launched from an aircraft carrier to measure cosmic ray activity at altitudes up to 120,000 feet.

March

U. S. to Puerto Rico direct dialing system utilizing the deepest submarine telephone cable in the world inaugurated. Pioneer V successfully launched from Cape Canaveral March 8.

April

Special Navy Issue of SIGNAL. Polaris missile assembly facility of the Naval Weapons Annex begins operations April 1. Frederick W. Ford appointed new chairman of the Federal Communications Commission. San Bernardino Air Materiel Area at Norton AFB, Calif., is first Air Force Depot to begin storage and maintenance of ballistic missiles. Transit I-B successfully launched from Cape Canaveral April 13. Tiros I launched April 1. Air Force Bomarc-B missile makes first completely successful launching April 13 at Eglin Air Force Base, Florida.

May

President Eisenhower sends greetings on the occasion of the 14th Annual AFCEA Convention held May 24, 25 and 26 at Sheraton-Park Hotel, Washington, D. C. Benjamin H. Oliver, Jr., elected to second term as AFCEA national president. First public demonstration of the Communications Moon Relay system at the opening of the Convention, May 24. Cape Canaveral becomes 49th chapter. Cincinnati becomes 50th chapter. Convention sets records: 4264 registered; 1200 attend banquet; 1200 attend buffet; 83 industrial exhibitors in 160 exhibit units. The Earl Mountbatten of Burma, Chief of Britain's Defense Staff, receives an honorary membership in AFCEA. Air Force dedicates automatic global communications system May 9.

June

SIGNAL salutes U. S. Army Signal Corps on its centennial with a special issue. Okinawa becomes 51st chapter. Transit 2A satellite successfully placed into orbit June 22.

July

White Sands Missile Range becomes 52nd chapter. AFCEA plans to expand 1961 Convention, June 6, 7 and 8, by increasing facilities to 120 exhibits at the Shoreham Hotel, in addition to the usual 110 exhibits at the Sheraton-Park Hotel. Rear Admiral William D. Irvin, USN, appointed the first Chief of the Defense Communications Agency. NASA launch operations, coordinated by a Launch Operations Directorate (LOD), became operational July 1. FCC hearings held concerning the allocation of frequencies above 890 mc for the use of non-government space communications. First Lithocom demonstration July 28, 1000 feet beneath the surface of the earth for a distance of 4½ miles. First amateur radio moon bounce July 21 between San Carlos, Calif., and Medfield, Mass. Two Navy Polaris missiles successfully launched from submerged *USS George Washington* July 20.

August

Echo I rocketed into orbit on August 12. Discoverer XIII capsule recovered from sea after being ejected from an Air Force satellite. Discoverer XIV capsule retrieved in mid-air August 19. X-15 rocket ship carries Air Force test pilot Major Robert M. White more than 24 miles skyward on August 12 in man's highest flight. Air Force test pilot Captain Joseph Kittinger free-falls 17 miles and parachutes the remaining 2½ miles to earth August 16. First B-58 Hustlers, operational supersonic bombers, received at SAC.

September

Lawton-Fort Sill becomes 53rd chapter. Herbert Clark Hoover, 31st president of the United States, is presented an honorary membership in recognition of his outstanding work fostering the advance of radio during his term as Secretary of Commerce from 1921 to 1928. The new Industrial College of the Armed Forces dedicated September 6 by President Eisenhower. Single Sideband Ham Contest held September 10 and 11. September 13 proclaimed "General of the Armies John J. Pershing Centennial Day." Strategic target planning group established to pin-point targets for retaliatory action in the event of aggression. FCC allocates frequencies above 890 mc to private users. Ray E. Meyers receives special Edison Radio Amateur Award. A copy of SIGNAL Magazine among items placed in a time capsule at Fort Monmouth which will mark the Signal Corps 200th birthday when opened in 2060.

October

The Courier satellite successfully launched October 4. Editorial by SIGNAL's Editor transmitted to the Courier 1B satellite from the Puerto Rico ground station and received at Fort Monmouth, N. J. on October 11. General Lyman L. Lemnitzer, USA is named chairman, Joint Chiefs of Staff upon the retirement of General Nathan F. Twining. First BMEWS station becomes operational. Turnkey Post Office inaugurated October 20 by Mrs. Arthur E. Summerfield, wife of the Postmaster General. Detection station for underground nuclear explosions completed near Fort Sill, Okla. First Courier photograph transmitted.

November

Lexington-Concord becomes 54th chapter and Marianas is 55th chapter. *USS George Washington*, nuclear ballistic missile submarine, becomes operational November 15. Explorer VIII satellite launched by NASA November 3. Dr. Willard F. Libby awarded 1960 Noble Prize in chemistry for "atomic clock;" Dr. Donald A. Glaser in physics for the "bubble bath chamber." Tiros II launched November 23. Discoverer XVII capsule recovered by aircraft November 12.

December

USS Patrick Henry, second Polaris submarine, becomes operational. Echo satellite commemorative stamp issued December 15. Discoverer XVIII capsule recovered December 10. Robert S. McNamara nominated Secretary of Defense.

AFCEA Sustaining and Group Members

Communications—Electronics—Photography

Listed below are the firms who are sustaining and group members of the Armed Forces Communications and Electronics Association. By their membership they indicate their readiness for their share in industry's part in national security. Each firm nominates several of its key employees or officials for individual membership in AFCEA, thus forming a group of the highest trained men in the electronics and photographic fields, available for advice and assistance to the armed services on research, development, manufacturing, procurement, and operation.

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- American Telephone & Telegraph Co., Long Lines Department
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- General Electric Co., Defense Electronics Div.
- International Telephone & Telegraph Corp.
- New York Telephone Co.
- Radio Corporation of America
- Western Electric Co., Inc.

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- Allied Radio Corp.
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- Anaconda Wire & Cable Co.
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Chapter News

REGION A

Fort Monmouth

Commander R. L. J. Long, USN, Commanding Officer (Gold Crew) *USS Patrick Henry*, was guest speaker at the November 17 meeting held at Gibbs Hall, Fort Monmouth Officers Club.

Commander Long discussed the timely subject of nuclear submarine operations and his experience as Commanding Officer of nuclear submarine *Patrick Henry*. He also spoke of some of the aspects of the Polaris Fleet Ballistic Missile Defense System.

The *Patrick Henry*, the second Fleet Ballistic Missile submarine to be constructed, is 380 feet long with a beam of 33 feet and a surface displacement of 5,700 tons. Fast, silent and virtually immune to surprise attack the submarine combines the almost unlimited endurance of nuclear power with the deterrent might of 16 Polaris missiles.

New York

Past Presidents Night was held November 30 at the Belmont Plaza Hotel. Guest speaker was past president and present director Vice Admiral Ellery W. Stone, USNR (Ret.), who spoke on "International Communications — Past and Future."

The chapter elected officers and directors for 1961-62 at the meeting. Those elected for a two year term are: president Glenn D. Montgomery; vice presidents, Frank A. Gunther, Colonel J. Z. Millar, Major T. N. Pope; treasurer, M. G. Nattress; secretary, R. W. Kleinert; membership secretary, O. S. Ostberg.

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Rome-Utica

The November 29 dinner meeting was held at the Green Acres Restaurant. Guest speaker was Al Feiner, chief of the Advanced Development Laboratory of RADC's Directorate of Communications. He spoke on Echo I, the communications satellite, and of RADC's role in this successful experiment. A movie, slides and an actual tape of conversation bounced off the satellite were also presented.

Syracuse

A dinner meeting was held November 9 at the Drumlins Country Club, with 80 members and guests attending. Guest speaker was Commander Thomas R. Rhees, USN, a member of the staff of Vice Admiral William F. Raborn who is responsible for the development of the Navy's Polaris Fleet Ballistic Missile Weapon System.

Cdr. Rhees discussed the geopolitical background against which the forces of the free world are engaged. He also showed a film on the development of the Polaris system. He said what made the system unique was that it made use of the oceans as a missile launching pad, particularly from the nuclear submarine which the Navy has already proved, can go anywhere in international waters.

Cdr. Rhees called the system the nearest thing to an invulnerable weapon ever devised. He said the Fleet Ballistic Missile submarine carries 16 Polaris missiles with a greater explosive force than all of the bombs dropped by either side during World War II including the atomic bombs.

REGION B1

Philadelphia

A joint meeting with the Franklin Institute, American Institute of Electrical Engineers and the chapter was held October 5. There were 275 attending the meeting. Guest speaker was J. M. Bridges, Director of the Office of Electronics, Office of the Director of Defense Research and Engineering.

He discussed the importance of electronics to our national security. He said that perhaps the best measure of electronics' importance in defense is the amount of national effort and defense dollars being spent in this area. Currently, the military departments are spending around $6 billion a year for electronics research, development, engineering and production. This sum is well over one-half the total national output of our electronics industry and almost one-quarter of the total defense expenditure for all research, development, engineering and production.

Mr. Bridges said, "we must keep hoping for, and working toward, a political or sociological kind of breakthrough that will lead to permanent peace among the great powers of the earth. At the same time, we must seek the technological breakthrough that will enable us to keep our armed services strong enough to deter military aggression on all fronts until it is possible to bring about the disarmament of nations in a safe and generally acceptable manner."

REGION B2

Dayton-Wright

Allan F. Schmahl, executive vice president of the chapter, was chairman of the October 27 dinner meeting held in the Main Ballroom of the Van Cleve Hotel, Dayton, Ohio. Major General W. A. Davis, Commander, of the Aeronautical System Center, Dayton, Ohio, spoke to the 190 members and guests.

He pointed out that the continued world wide dominance of American aerospace power depends largely on how quickly and how successfully we translate advanced system concepts into effective weapons. For this reason, he said, "the evaluation, selection and programming of advanced systems is of tremendous importance to the future of our national defense." He discussed some of the systems saying, "we must stay abreast of the multitude of ideas and concepts generated by industry. We dare not lose sight of the need to meet the ever increasing threat of our potential enemy. All these factors indicate that we must expand our capability to provide the basis for the Air Force to make wise and sound decisions before starting future weapon system programs."

The November 17 meeting was held at Wright Patterson Air Force Base Officers Club. Guest speaker was Dr. Leonard S. Sheingold, director, Applied Research Laboratory, Sylvania Electronic Systems, Waltham, Mass.

Dr. Sheingold said missiles with computer units sealed in their nose cones could be the military "homing pigeons" of any future nuclear war. He told the chapter that the critical need for completely dependable command and control of the free world's military strength would necessitate exotic or unorthodox communications systems.

"Weapons have become so accurate, and bombs have become so lethal, that the command and control of these agents of destruction has become one of the most pressing of military problems."

REGION C

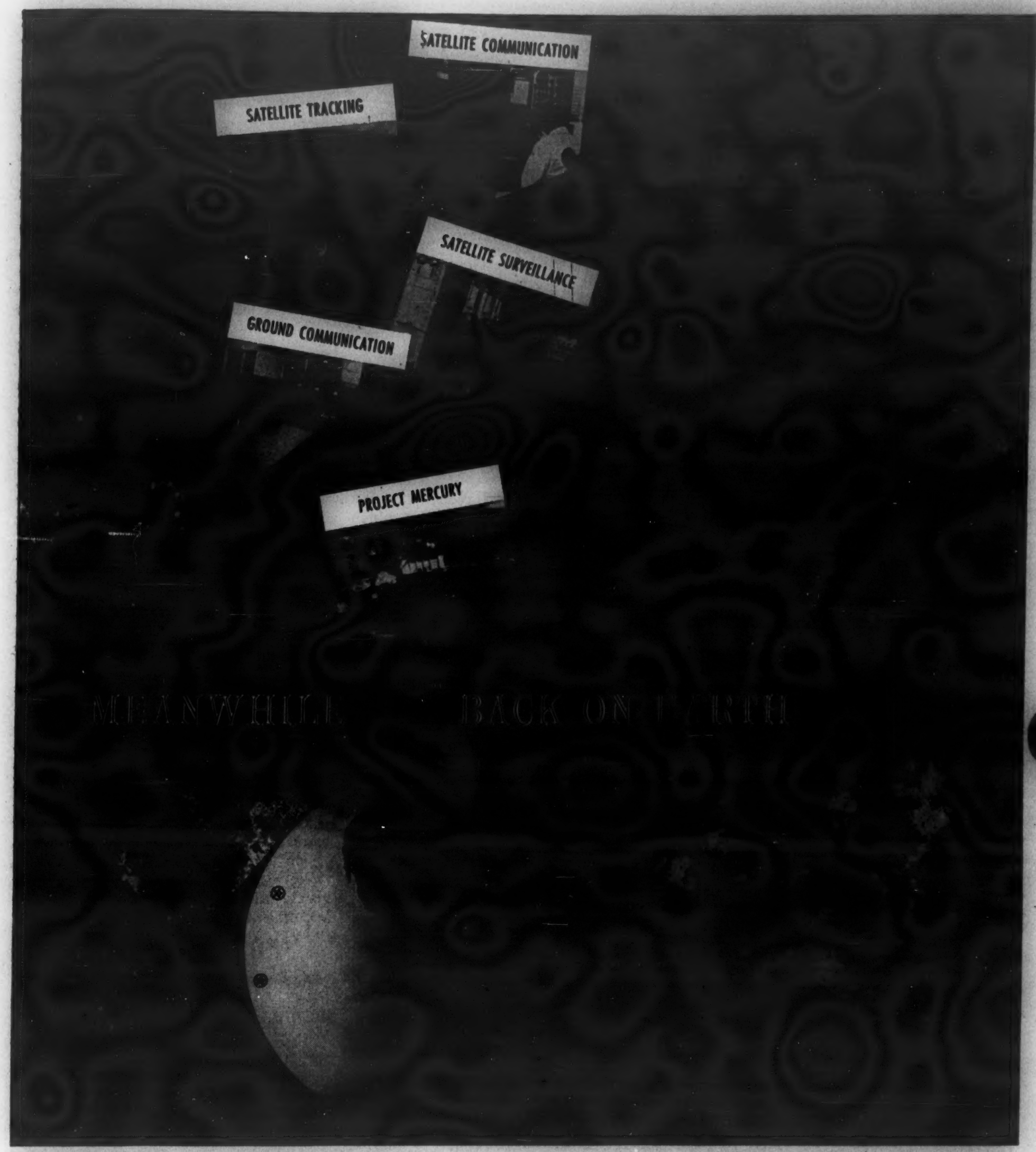
Augusta-Fort Gordon

Forty members and guests met at Mirror Lake, Fort Gordon, for the November 17 meeting. The business meeting included committee reports and the election of officers.

Those elected to office are: president, Colonel T. J. Trainor, USASTC; 1st vice president, John W. Owen, Southern Bell Telephone and Telegraph Co.; 2nd vice president, Major George A. Dewey, USASTA; 3rd vice president, Otto Lechman; secretary, Lieutenant Colonel H. T. Crowell, USASTC; treasurer, George Norman.

Elected as members of the board of directors are: Carl Rodgers, Captain Egbert Buckout, Orian S. Niehuss, Colonel W. A. Glass, James A. Prestwood, Sam Strauss, Colonel John M. Raleigh and Francis A. Saxon. National committeemen are General Ben H. Pochyla and Colonel R. R. Creighton.

Following the election of officers and appointment of committee chairman two films, "The Big Bounce" and



systems integration There is an efficient, money-saving formula for answering range instrumentation and communication network problems. It is to take proved equipment, modify it as necessary, design anew where required for system optimization, and package for the specific need. Bendix Radio is already doing this for MINITRACK, SPASUR, MERCURY, CRITICOM Interim and point-to-point communications. The operational effectiveness of these Bendix Radio fixed and mobile systems is exceptional. The same kind of performance—at minimum cost—is available to you. So, if you're looking for a down-to-earth solution to a systems integration problem, see us.

Bendix Radio Division

GOVERNMENT PRODUCTS · BALTIMORE 4, MARYLAND

"Seconds of Survival" were shown.

The annual Christmas party and Ladies Night was held December 15.

Gulf Coast

Eighty-five members and guests attended a dinner meeting November 7 at the Buena Vista Hotel, Biloxi, Mississippi.

Lieutenant Colonel William F. Curry, who is in charge of TV Control training at Air University, Maxwell Air Force Base, spoke on the use of TV on closed circuit educational television.

Montgomery

A dinner meeting was held October 27 at Maxwell Air Fore Base Officers Club with 52 members and guests attending. Special guests were: Lieutenant Colonel Russell E. Gray, Air Force Missile Test Center, Patrick Air Force Base, Florida; G. M. Todd, Engineering Staff Operations Manager, Southern Bell Telephone Company, Atlanta, Ga.; S. W. Reese, Chief Engineer, Southern Bell Telephone Company, Birmingham, Alabama.

Col. Gray presented a program entitled "Our Pioneering Base for the Aerospace Age," which included a lecture and movie of the various missile shots conducted at Cape Canaveral.

He said that science and technology, especially as they relate to the missile art, have passed many milestones in the past six years. He added that the Cape Canaveral facility has not only helped to hasten the milestone of operational Air Force ballistic missiles, but has been instrumental in carrying out related space probe and satellite projects.

North Carolina

More than 300 military and civilian members of the chapter met November 21 at the Fort Bragg Officers Club. Guest speaker was Edmund Harding. A communication-electronics film which emphasized the increasing importance of this field in national defense was also shown.

REGION E

Chicago

Members of the chapter were guests of Abram Davis, president of Allied Radio Corporation for the meeting held during the last week of October. Guest speaker Eugene McFarland, marketing manager, Texas Instruments Company, discussed semi-conductor networks.

Kansas City

The October 20 meeting was held at the Officers Club, Richards Gebaur Air Force Base, Missouri, with 63 members and guests attending.

Guest speaker Charles S. Stevenson, civilian aide to the Secretary of the Army for the state of Missouri, spoke on "The Calculated Risk of America's Defense Posture." His talk covered his experiences while visiting the Armed Forces installations in Europe and the Far East during the past six months.

Rocky Mountain

AFCEA national president Benjamin H. Oliver, Jr., was guest speaker at the October 25 meeting. He spoke on AFCEA and the expansion of the electronics-communications field.

Mr. Oliver said that the primary mission of AFCEA is to see that communications, and the people in the fields of electronics and photography, in military and in civilian life, have close liaison with each other. He said this closeness of relationship is not a nicety, but a necessity. "When the time comes, if it does, that the nation's security indicates that military communicators, and those engaged in electronics and photography fields must run in double harness with their counterparts in civil life, there will be hardly enough time to get hitched up," he said.

Mr. Oliver discussed recent growth and the part the Association can play to help fulfill the mission of electronics and communications. He illustrated his talk with film strips and a short movie on Courier and Echo.

REGION F

Greater Los Angeles

A dinner meeting was held November 16 at the Statler Hilton Hotel, Golden State Room, with 115 members and guests attending. The appointment of Clay W. Bailey of Convair-Pomona, to succeed Frank Shannon, as second vice president, was announced by chapter president John W. Atwood.

Guest speaker was Raymon W. Hallett Jr., assistant to the chief engineer for Missile and Space System, Douglas Aircraft Company, Santa Monica, Calif. His talk, illustrated with slides, told of some of the problems of space. He told the group that deep space exploration is dependent on new engine design and that progress to date is encouraging. He explained how necessary it is in our program of space probes that we know what man can expect and what we must cope with in the far reaches of our planetary system.

Mr. Hallett also showed a film on Pioneer I launching.

San Francisco

Following dinner at Ming's Restaurant on November 17, members and guests of the chapter toured the Eastman Kodak Processing Plant at Stanford Industrial Park, Palo Alto. The tour was arranged by Hal Leler.

Santa Barbara

A dinner meeting was held November 4 at the El Paseo Restaurant. Thirty-three members and guests heard speaker Rear Admiral William Organ, USN (Ret.), discuss "The Relationships of the Military-Industrial Operational Team."

Admiral Organ, manager, Federal Electric Corporation, Point Arguello, pointed out that military titles are not used in joint civilian-military meetings in order to forestall any inhibitions and to attain a cooperative and harmonious climate. An analogy was drawn between the ability of the English Navy to rise from a merchant fleet into a mighty war fleet in a short time by drawing on the reservoir of trained men in the merchant marine. In like manner, according to Admiral Organ, we have a reservoir of civilian men and women trained in the fields of war preparedness and the space age which could be called upon by the military in the event of war.

Seattle

A dinner meeting was held November 9 at the Benjamin Franklin Hotel. Following a business meeting chapter president Roy Pace showed a film, "The Big Bounce," through the courtesy of Pacific Telephone-Northwest, with whom he is affiliated. The film is a documentary on Project Echo, the satellite communications experiment.

C. Weldon Lawrence, special assistant to the Commanding Officer, Alaska Communications System, Seattle, Wash., gave an illustrated presentation on the Alaska Communications System. He described the development of ACS dating from 1901 and traced the steady expansion which has resulted in a modern and effective communications system serving Alaska in much the same manner as the commercial carriers operate in the remaining states. Color slides depicted ACS installations ranging from Ketchikan to Kotzebue and included many closeups of equipment. Special problems peculiar to Alaska such as communications with canneries, fishing craft and isolated settlements were dealt with at length.

CHAPTERS AT LARGE

Marianas

The chapter was officially presented its charter at a ceremony held at the Officers Club, Anderson AFB, October 29.

Major General Harold W. Grant, Director of Telecommunications, Hq, USAF, national AFCEA vice president, presented the charter to chapter president Lieutenant Colonel Wilmer E. Bullard, commander, 1958th AACS Squadron (USAF).

Colonel Bullard introduced Major General Daniel C. Doubleday, commander, AACS/USAF; Brigadier General Haskell E. Neal, commander GEEIA/USAF and Brigadier General Bernard M. Wootton, commander, Pacific AACS Area/USAF, who with General Grant were on an official visit to Air Force Communications Installations and Facilities in the Far East. Captain C. John Alley, Naval Communications Station, Guam, was also a special guest.

Philadelphia—(photo left) Guests in the receiving line at the October 5 meeting are: (L to R) J. M. Bridges, guest speaker; Mrs. Bridges; R. Halberstadt, program chairman; R. G. Swift, president. (photo right) **North Carolina**—Officers of the chapter at the November 21 meeting: (L to R) E. M. Veale, 2nd vice president; Col. P. Van Sloun, vice president; J. F. Havens, president; J. C. Coley, secretary-treasurer.

Montgomery—Pictured at the October 27 meeting: (L to R) Lt. Col. H. Herman, chapter president; Lt. Col R. E. Gray, guest speaker; special guests G. M. Todd and S. W. Reese.

Augusta-Fort Gordon—At the November 17 meeting: (L to R) Col. H. Sanford; F. A. Saxon, outgoing chapter president; J. W. Owen; Lt. F. H. Baker.

Chicago—(photo left) At the October meeting: (L to R) W L. McGuire, Automatic Electric Co., chapter president; E. McFarland, Texas Instruments Co., guest speaker; A. J. Schmitt, Amphenol-Borg Electronics Corp., vice president; A. Davis, Allied Radio Corp. H. Bendtsen, Paraplegics Manufacturing Co., new vice president. (photo right) **Syracuse**—Inspecting construction of absorption refrigeration machines made by Carrier Corp., for atom-powered submarines are: (L to R) W. H. MacDonald, Carrier Corp.; Cmdr. T. R. Rhees; J. F. Kooistra, Carrier Corp.; T. M. Johnston; R. H. Rice; Lt. Cmdr. J. T. Boehret.

Fort Monmouth—(photo left) At the November 17 meeting: (L to R) Dr. H. K. Ziegler; Cmdr. R. L. J. Long, guest speaker, Brig. Gen. C. M. Baer; Capt. S. E. Edelstein. **Marianas**—(photo right) Pictured at the October 29 meeting at which the chapter received its charter are: (L to R) Maj. Gen. D. E. Doubleday; Brig. Gen. B. M. Wootton; Lt. Col. W. E. Bullard, chapter president; Maj. Gen. H. W. Grant.

Dayton-Wright—(photo left) Pictured at the November 17 meeting are: (L to R) A. F. Schmahl, executive vice president; Mrs. R. L. Salzarulo; Dr. L. S. Sheingold, guest speaker; Col. R. L. Salzarulo, president; Mrs. A. F. Schmahl; Col. A. L. Wallace, Jr. **Lexington-Concord**—(photo right) Head table guests at the November 22 charter meeting: (L to R) W. A. Melansen, secretary Boston chapter; G. D. Montgomery, regional vice president; G. Twigg III, chapter vice president, programs; B. H. Oliver, Jr., national president; D. V. Mayer, chapter president; W. Roberts, national director; W. J. Baird, AFCEA general manager; W. Christopher, president, Washington chapter.

Association News

Scholarship Fund to be Aided by Ray Meyers

AFCEA'S Scholarship Fund, which was established to help young people receive an education in the fields of communications, electronics and photography, will be aided in the future by fees from a series of lectures by Regional Vice President Ray Meyers. His talks will be based on experiences aboard the first *Nautilus*.

Mr. Meyers, retired Navy lieutenant commander, is one of the four living survivors of Sir Hubert Wilkins' 1931 trans-polar submarine expedition. Illustrated by a movie of the early voyage, his lecture will detail the submarine's outfitting, the Atlantic Crossing and the first dive under the Arctic ice cap.

As a contrasting note, he also will present a documentary color film of the historic Arctic crossing made in 1958 by the atomic submarine *Nautilus*.

Mr. Meyers has offered to appear before any AFCEA group at no cost to the chapters, provided transportation can be arranged. While in the chapter area, he plans to deliver paid lectures to organizations not connected with AFCEA.

In explaining his program to aid the scholarship fund, Mr. Meyers said, "Any chapter could schedule the lecture for a regular or special dinner meeting and at the same time notify various local service organizations, lecture bureaus, etc., as to my availability within a day or so of the chapter meeting. The cost to one of these local organizations would be $100 payable to AFCEA and marked for the AFCEA Scholarship Fund.

"My opening remarks, naturally, would credit AFCEA and the local chapter for making my appearance possible."

Chapters interested in this project may contact Mr. Meyers directly at 717 Anderson Way, San Gabriel, Calif., ATlantic 2-0014. All requests should be made at least a month prior to the chapter meeting which would feature his lecture.

(Editor's Note: In October 1958, SIGNAL carried an account which dealt with the first *Nautilus* trip and the 1958 *Nautilus*.)

Charter Meeting at Lexington-Concord

The Lexington-Concord chapter received its charter at a meeting held November 22, at the Carriage House, Lexington. Special guests attending the meeting were Benjamin H. Oliver, Jr., AFCEA national president, Glenn D. Montgomery regional vice president, and W. J. Baird, AFCEA general manager and editor of SIGNAL.

Mr. Oliver addressed the first gathering and stressed the importance AFCEA plays in Military-Industry relationships.

One hundred and sixty-four charter members, representing approximately 40 electronic firms and members of various branches of the Army, Air Force and Royal Canadian Air Force attended the first meeting.

Letter to the Editor

Lola Dickerman, Boston attorney, a member of the Lexington-Concord chapter and staunch supporter of AFCEA has sent the following letter to W. J. Baird, AFCEA general manager and editor. The letter is very meaningful.

Dear Col. Baird:

At the recent chapter meeting of the Lexington-Concord chapter of AFCEA you asked me to write you a note on "what AFCEA membership means to a woman."

I have considered your question, and I think that a woman has no special viewpoint on AFCEA; that all of this country's citizens have the same concern and interest in our defense establishment.

Debates and discussions as to the most effective ways in which this country can achieve and maintain peace through preparedness have dominated our national scene for years. Our military and civil leaders, and political candidates have all expressed themselves on this subject. AFCEA offers its members a forum for education and discussion of this vital subject with particular emphasis on the rapidly advancing arts of communications, electronics and photography. Finally, and not unimportant, AFCEA has made a significant contribution in destroying the old myth that there is any conflict in purpose between the military customer and its industrial supplier.

Sincerely yours,

Lola Dickerman

Executive Committee Meeting Planned

The Executive Committee will meet January 26 at the offices of Hughes Aircraft, Washington, D. C. Among items for consideration are plans for the 15th AFCEA Convention to be held June 6, 7 and 8, in Washington, D. C.

Convention Plans Underway

Plans for the 15th Annual AFCEA Convention are finalizing. Contracts have been sent to all of last year's exhibitors and to new potential exhibitors. Contract acceptances have been coming in daily and National Headquarters is pleased with the number of booths already sold.

Arrangements are also under way for the panel discussions which will be on timely and important subjects in the fields of communications, electronics and photography.

W. J. Baird, AFCEA general manager, Convention chairman says that plans are progressing well. His assistant, Campbell Steward should be contacted for any Convention information. The February issue will contain a more detailed report. For now see page 22.

NAVY HONORS NEWSPAPER FOR AMATEUR RADIO OPERATIONS

Mr. George R. Hearst, Jr., Publisher
Los Angeles HERALD-EXPRESS
Los Angeles, California

My dear Mr. Hearst:

During the summer of 1960, the Los Angeles HERALD-EXPRESS commenced publication of a series concerning amateur radio communications. These have been read by this Office with great interest and much appreciation.

In this Country and in America's climate of freedom and free enterprise the combination of amateur radio operators and manufacturers of amateur radio equipment has advanced U. S. communications technically. Amateur radio activity provides the Nation with a technological pool and a reservoir of skills which only time, tenacity, money and personal desire can produce under voluntary circumstances. These are the tangibles.

The intangible is the spirit of the radio amateur. This spirit is akin to patriotism. The radio amateur makes personal sacrifices in time of local disaster or national emergency to the benefit of community and Country.

In publicizing the radio amateur craft, your articles about amateur radio are believed to be unprecedented in frequency and length among American newspapers. Furthermore, no other articles on the subject appearing in American newspapers are known to have been better done or illustrated. In this support program, the Los Angeles HERALD-EXPRESS has been generous with valuable space.

It is with great pleasure, then, that the Navy and Naval Communications say "Well Done!" to you, to the Los Angeles HERALD-EXPRESS and Mr. Tom Cargo, the feature writer of these articles in this worthy and informational support effort for amateur radio. It gives me further pleasure to present you and Mr. Cargo with certificates naming you "Honorary Naval Communicators" of the United States Navy as additional symbols of appreciation.

Very truly yours,
Frank Virden
Rear Admiral, U. S. Navy
Director, Naval Communications

Rear Admiral Frank Virden, director of Naval Communications, presents a letter of commendation and accompanying scroll to David Sentner, Washington Bureau Chief of Hearst Newspapers, who accepted the award for George R. Hearst, Jr., publisher of the Los Angeles Herald-Express.

NEW MEMBERS

Listed below are new members of the AFCEA who have joined the Association during the month of November. Members are listed under the chapter with which they are affiliated. Amateur radio operators are listed with their call letters.

Arizona
1st Lt. Kenneth J. Offman

Atlanta
Grady M. Duckett
Edgar M. Holberton
Plato S. Rhyne
Lillian L. Shaver

Augusta-Ft. Gordon
Capt. James A. Carlile
Col. William A. Glass, Jr.
Preston D. Harpe
Louis L. Hattman
1st. Lt. Glenn A. Leister
George W. Norman

Baltimore
Donald F. Mahoney
Gerald Lee Showalter

Boston
Gilbert A. Barrett
Peter C. Card
Maj. George Green
Archie H. Harris
George I. Neiman
John Ohman
R. Thomas B. Peirce
William J. Schoenberger
C. Wayne Spencer
George R. Welti
Lt. Col. Lawrence D. Williams

Chicago
William Blinoff, Jr.
Mrs. Ethel M. Buschman
William J. Caprata
Lt.Cdr. Edwin M. Cole
Robert W. Conradi
Fred M. Crapo
Thomas H. Everhart
Col. Turner W. Gilman
Rydyard R. Pavlik
Capt. Daniel L. Thomas

Dayton-Wright
James E. Castanias
Seymour S. Levine
Lt. Col. Paul T. Ryan
Charles B. Stebel

Decatur
Robert Bold
Donald G. Leonard
Don Maddox

Detroit
Jack A. Dolsen

Ft. Monmouth
Sp 5 John J. Angell
Lt. Col. James T. Babitt
Robert S. Boykin
John R. Bracken
R. H. Brown
Gerald V. Ceres
Col. John B. Corbly, Jr.
John D. Deisler
P. D. Dusinberre
Norman J. Field
Col. Raymond H. Goodrich
Robert C. Hawley
Alexander Hindin
Hans E. Inslerman, W2CPL
Esther M. Ipri
Valentine Ipri
Maj. Philip L. Jacobs
Patrick H. Kelsey
Marvin H. Klayton
Mortimer N. Lansing
Lt. Col. Milo George Larson
Capt. Otto E. Pribram
Fred P. Pro
Wendell L. Rehm
Harrison Skeuse
W. Virgil Stine
Nelson A. Terhune, W2GGL-K20NV
Louis Teschler

Greater Los Angeles
Maj. Paul F. Bent, K6RZD
Wiley V. Conover
Wallace E. Cook
John W. Dodge
John K. Hilliard
Gilbert L. McGowen
James B. McKenzie
Maj. Maxwell G. McLeod
James W. Noland
George D. Pugsley
Douglas J. Upton
Conrad Youngerman

Gulf Coast
Capt. Robert B. Linvile

Hawaii
William P. Alexander, Jr.
Joseph M. Lynd
Walter R. McClellan
Capt. Vannah E. VanHorn

Kansas City
Maj. Zenon W. Dembitsky
Robert L. Dunn
Jerry D. Feldt
Charles W. Horne

Korea
Sgt. Albert V. S. Colen

Lawton-Ft. Sill
Lynn W. Russell
Charles C. Turner

Lexington-Concord
Lt. Col. David Anderson
C. B. Appleman
C. Kemp Bennett
George F. Benoit
Maj. Gen. Kenneth Berquist
Donald H. Beu
Charles E. Callahan
Thomas Grover
Asaph H. Hall
Franklin R. Heyner
James J. Hoar
L. Robert Hoffman
John P. Hogan
Vincent R. Locicero
Lyon McCandless, Jr.
Lt. Col. Howard W. McCellan
Kenneth E. McVicar
Ernest H. Macfarlamb
Theodore G. Macklin
A. M. Marzano
Col. Osborne C. Mauldin
John F. O'Sullivan
Carl A. Peterson
Carmine Pinto
Lt. Col. Everett G. Reed
John F. Regan
Robert V. Ridpath
Martin Schilling
Col. Charles C. Segrist
Jacob S. Selnick
Joseph J. Slomski
Raoul D. Smith
Paul J. Thornberg
Frederick J. Walsh
Daniel Weatherwax

London
C. Barwell
E. A. Chapman
I. K. Chrismas
G. A. Gilbert
Lord Glanusk
P. A. L. Harris
H. B. MacDonald
D. Rolinson
Patrick H. Stephenson
B. L. P. Terry
J. Tyndall

Louisiana
Jack H. Carlisle

Marianas
Willis S. Cannon, Jr.
Murray C. Colliere
RM1 Sherrill Crigger
George T. Harris
Otis C. Harrison
Maj. George W. Hill, Jr.
Lewis E. Kitson
Andrew J. Loftus
SM Sgt. Leon G. Sarkesian, K1DNX
Lt. Cdr. Walter N. Scott
T-Sgt. John A. Vance
Robert F. Wentz

New York
Richard W. Boughton
James K. Bundy
William E. Burke
Brig. Gen. Robert E. Fojt
Jerome G. Friedman
Arnold H. Henriksen
Tadeusz Jozef Jaronski
Robert W. Kleinert
Hall F. McKinley
John P. Nicholson
Maj. Edward J. Schaffer
Ira Schulman
Francis S. Sinclaire
John Zilinski

North Carolina

Curtis M. Fields
Col. David T. Griffin
Cmdr. Robert J. Werder
T. P. Williamson

Northeastern University

Robert Paul Ceresi
Harold Alfred Davidson, Jr.
Daniel F. Dunn, Jr.
Roger W. Hubbard
George H. Lentz
John Allen McDonnell, Jr.
Paul N. McNamee
William E. Maguire
Basil S. Moskos
Richard Normile Perkins
Leo H. Norton
John Arthur Robinson
Lon A. Williams

Northwest Florida

William L. Fretwell, Jr.
Robert A. Goodwin
Bascomb R. Grant
RMC Daniel E. Hansen
Capt. Behford A. Larson
Albert C. Maxey
M-Sgt. James C. Smith
John C. Steiner

Orange

Lt. Col. Donald E. Dobbins
James R. Noone

Paris

SP4 Clarence B. Allgor, Jr.
Alex Benton
Lt. Col. Howard B. Briley
M. Carminati
Remo Costi
J. Dewerse
Brig. Gen. K. E. Fields
Roy W. Fraser
Jean F. Gueritaud
R. Montin
Jan C. Vos

Philadelphia

Joseph S. Alleyne
Richard L. Berry
Col. Winton O. Etz
Alfred W. Kupferschmid

Philippine

Luis M. Adrales
1st. Lt. Raymond E. Bratcher
William Wallace Bush
Eusebio R. De Luzuriaga
Jack Friedman
Col. Cecilio C. Leoncio
Robert A. McLellan
Lt. Col. Armando V. Medel
T-Sgt. Clifford R. Muegge
John M. Palmer
Eliseo Santos
A. J. Schultz
Lt. Cdr. Loren R. Stiegelmar
Col. Manuel B. Syquio
Richard D. Wharton

Rocky Mountain

Capt. Tarlton A. Guyote
Capt. Bruce Higgins
William S. Hills
J. Alfred Peister
Wayne F. Scott

Rome-Utica

Edwin C. Barth
Neil J. Fitzgerald
Theodore K. Tyler
John R. Woods

San Diego

Howard T. Hoffman
John C. Orthel
John V. Pflaum
Adm. Eddie R. Sanders

San Francisco

Cmdr. Donald A. Caswell
N. Ralph Cherrigan
Kenneth V. Hayes
C. B. Melter, W6MAC
Thomas Wortman

San Juan

Milton Castro
Victor M. Garcia
Harley Higgins
Donald F. Lanigan
Ramon Marti
Rafawl A. Rivera
Paul J. Steves
Jorge Toledo
Rafael Vidal

Santa Barbara

Peter Baum
Donald G. Beck
Peter Bickerdike
Richard Burkhardt
David Carrier
Charles Clapp
Peter Crawford
Marvin Finnley
Rolf R. Gehlhaar
Rolf Gulbrandson
Adam R. Huggins
Robin Joice
Steve King
Jim Mattinson
Dennis A. Nagy
William Pasich
Maarten Pranger
Daniel Randtke
Clark C. Rodimon
David Sangster
Joseph J. Sayovitz, Jr.
Roger Smith
Derek Westen

Scott-St. Louis

James L. Elswick
Harry B. Latina
Donald E. Mitchell
Michael A. Stein

Seattle

Lt. Marvin W. Alnutt
Maj. Douglas H. Carter
Elmer Dubuque
Erle C. Hathaway
Dean G. Roath
Lewis F. Rylie, W7CKT
John Whittaker

South Carolina

Capt. Gilbert L. Countryman
Lt. Cdr. William H. Holmes
Lt. Cdr. Burke S. Vermillion

South Texas

Kenneth L. Brooks
Jack G. Edwards
Ray L. Irwin

Southern Connecticut

Lawrence C. Kristiansen
W. B. Sturtevant

Syracuse

Phinehas P. Barnes
Brig. Gen. William L. Bayer
Lt. Michael Brill
Paul D. Chance
Arthur J. Grant, Jr.
Cmdr. William D. Greenfield
Vincent Hannon, Jr.
Cmdr. Thomas M. Johnston
John T. Kirkendall
John F. Kooestra
Lawrence S. McCahill
Leo P. Matzke
Guy John Ruston
Maj. Worth M. Speed
Earl J. Stout
Capt. Joseph E. Thompson
Maj. Gen. Henry Viccellio

Tinker-Oklahoma City

Beryl B. Green
Robert L. Grubb
Richard G. Martin
Wayne G. Miesen
Lynn A. Murrell
Maj. Robert W. Powell, Jr.
Richard V. Vorheis
Kenneth D. Wolf

Tokyo

Lt. Cdr. Lee G. Cutchall
Toshio Yeshimura

Washington

John M. Coffee
R. P. Crago
Marvin Frank
John P. Harris
Cmdr. S. Edward Hazelett
Lt. Col. Bruce E. Holmgrain
John V. Howie
John C. Knoerl, Jr.
Richard J. Lloyd
Peter J. Pavell
H. A. Ray, Jr.
William F. Rhodes
James L. Rogers
Lenna M. Roll
Lt. Col. W. W. Stegemerten
Joe L. Stewart
Merton D. Van Orden
Charles S. Wendel
John F. Whitehead
Joseph J. Wynne

Members At Large

London K. Allbright, K5MRQ
SP4 Ollie E. Cavender
Fikert O. Karaali
Raymond V. Kramer
Harold K. Lindseth
William G. McKeveny
Lt. Col. Verden McQueen
John Robinett
Mario Romano
William M. Swezey

NEWS ITEMS AND NEW PRODUCTS

The November 15, 1960 issue of *Physical Review Letters* carries reports on work done independently at Arthur D. Little, Inc., of Cambridge, Mass., and the General Electric Company on a low temperature phenomenon. The phenomenon indicates an approach to new phases of flexibility, dependability and compactness in electronic micro-miniaturization.

Scientists at Arthur D. Little's Advanced Research and Development Division observed an unexpected "switchback-action" or negative resistance region when current was passed through a metal-dielectric-metal sandwich at temperatures approaching absolute zero. Application of this negative resistance phenomenon is expected to lead to the development of a whole new family of simply constructed components compatible with present low temperature electronic circuits such as cryotrons. The new devices, called tunneltrons, may extend the range of cryogenic circuitry to include low noise amplifiers, high frequency oscillators, and new types of switches and memory devices usable in computers.

The tunneltron is the first evaporated electronic component to show a negative resistance. It was made by evaporating an aluminum strip onto a glass substrate, oxidizing it in air to form a thin surface layer of dielectric aluminum oxide, and then evaporating a thin cross strip of lead on top of the aluminum oxide. The tunneltron has extremely low power requirements and should operate at very high frequencies.

The observed negative resistance effect stems from the ability of electrons to pierce or tunnel through extremely thin layers about a millionth of an inch thick of material that is normally considered insulating. Observation of this tunneling current as it depended on the voltage applied across the experimental sandwich revealed a region where the current "switched-back," a region of negative resistance, provided the two metals were maintained in a superconductive state.

The superconductive state at low temperatures can be destroyed by imposing sufficiently strong magnetic field. This principle is used in the cryotron. It is possible, however, to utilize a changing magnetic field to control the superconductive state. This is one means that can be used to control the tunneltron. The cryotron and tunneltron complement each other and both are expected to play important roles in low temperature electronics.

The behavior of the tunneltron is similar in many ways to the behavior of tunnel diodes. However, devices based on the new discovery promise many advantages over tunnel diodes such as the ability to control negative resistance and hence the operation of a device by applying a magnetic field. Another advantage is the extreme ease of manufacture and great flexibility allowed the circuit designer since the metal-dielectric-metal sandwiches are made by standard vacuum evaporation techniques.

The Arthur D. Little physicists began the work in the field of low temperature physics over a year ago that led to their discovery as part of a long-range research program and its applications to electronic circuitry.

Ivar Giaever of the GE Research Laboratory observed the phenomenon while experimenting with tunneling through ultra-thin insulating films. Most of Giaever's experiments have been with films of aluminum, lead, indium and tin, all of which become superconductive at near liquid helium temperatures. A considerable number of other metals are expected to exhibit the same effect. In almost all of the experiments, aluminum oxide was the insulating layer, although Giaever has obtained proof of tunneling through tantalum oxide, niobium oxide and nickel oxide as well.

A great deal of applied research and development will be required to evolve practical devices based on this new concept. The discovery of new, previously unsuspected effects is making an important contribution to fundamental scientific knowledge of both superconductivity and tunneling.

• • •

The American Rocket Society recently made public its petition to the United States Court of Appeals concerning the FCC decision to release frequencies above 890 mc to private microwave applicants. This controversy has previously been reported in SIGNAL; see September 1960, p. 7 and November 1960, p. 54. The petition contends that the FCC did not take many pertinent facts into consideration in its refusal to grant frequencies to potential space communications organizations on an exclusive basis. The ruling in question was released on October 5, 1960—FCC Commissioner Craven wrote a sharp dissent to the ruling, primarily on the basis that the potential of space communications is very great, both economically and politically. Therefore its development should not be hampered by other services for which there is an acceptable alternative—leased land lines.

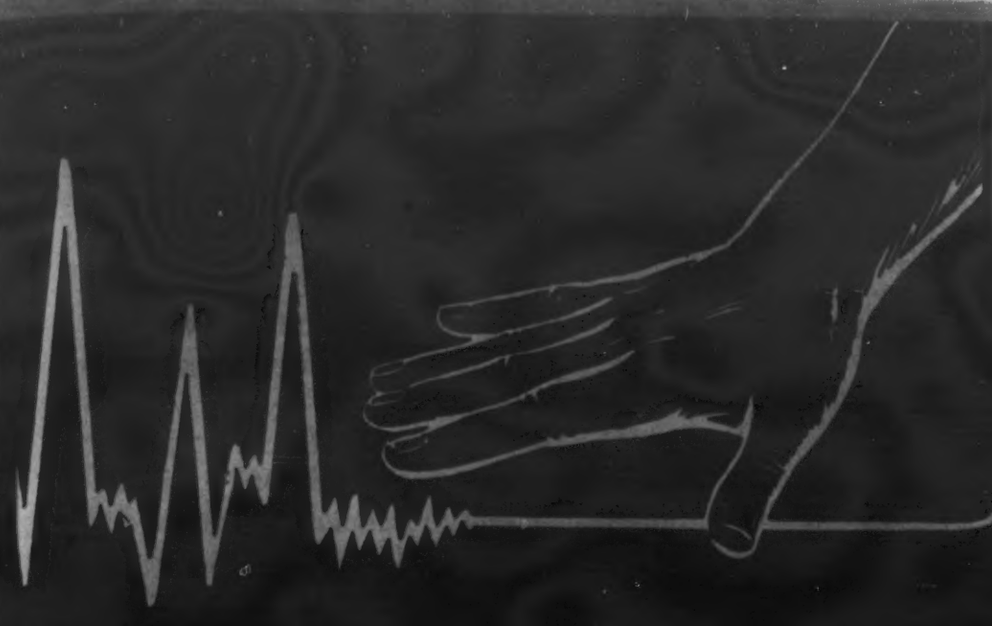
In its petition, the ARS cited the dissent of Commissioner Craven as evidence of support for its position within the Commission and stated that the FCC had abused its discretion by not considering space needs. The petition was signed by Andrew G. Haley, ARS General Counsel.

• • •

Charges that "technically unsound and legally questionable" actions taken last fall by officials of the U. S. Department of Interior may seriously handicap the nation's efforts to demonstrate a practical method for desalting brackish water were voiced recently by spokesmen for Ionics Incorporated of Cambridge, Massachusetts.

The Office of Saline Water distributed a news release last November announcing award of a $482,200 contract for construction of a 250,000-gallon-per-day brackish water conversion plant at Webster, S. Dakota, to a large Japanese firm, Asahi Chemical Industries Company. The Webster plant is to operate on the electric membrane or electrodialysis process for which Ionics holds basic patents in the U.S. and many foreign countries, including Japan.

"Asahi Chemical has no commercial experience in desalting brackish water as required in the bid specifications put out by OSW," said Lewis A. Rupp, vice president of Ionics. "In addition, on a 20-year operating basis the Japanese plant will cost the U.S. taxpayer substantially more than an already tested Ionics design. The Japanese plant as designed will not operate at required capacity on the particular water at Webster because of scaling and the resulting high labor and membrane replacement costs," he said. "The Asahi plant, as shown in engineering infor-



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Marking the presentation to the U. S. Army Signal Corps by the Western Electric Co. of a radio set which operates perfectly using 42-year-old VT-1 tubes, are Maj. Gen. R. T. Nelson, center, Chief Signal Officer; W. H. Doherty, right, Western Electric and R. A. Heising, left, transmitter designer. 42 years ago, the VT-1 was used in the first air-to-ground radio gear demonstrated for President Wilson. —U. S. Army Photo.

mation supplied to OSW on October 17, is about 50 percent under the design requirements for this type of mineral water. We know this from practical experience gained through successfully operating a 250,000-gallon-per-day plant at Oxnard, California, using natural waters of similar chemical composition. Our objection to the Asahi contract award is strictly on the basis that this selection is technically unsound, legally questionable and is not in accordance with the published objectives of demonstrating processes—which have been previously proved through field experience."

A decision on a declaratory judgment brought by Ionics last July against Asahi Chemical Industries for infringement of membrane patents is now pending in the Japanese Patent Office.

House Majority Leader John McCormack (Dem., Mass.) and Representative Thomas P. O'Neill, Jr. (Dem., Mass.) protested the award in wires to President Eisenhower and former Secretary of the Interior Fred Seaton and wired the House Committee of the Interior requesting immediate investigation of the Japanese award and withholding of the contract until all the facts have been aired. Senators Saltonstall (Mass.) and Mundt (S. Dakota) also sent telegrams to Seaton protesting this award.

• • •

A new method to determine the exact location, range and the number of satellites orbiting the earth was outlined in a speech by Lt. Robert M. L. Baker, Jr., at the Seventh Annual Science and Engineering Symposium sponsored by the Air Research and Development Command last November.

"It would be of military advantage," Baker said, "to include a self-contained friend-or-foe satellite identification device on board a Satellite Inspector (SAINT)-type vehicle — a device that would not be dependent upon a continuous communication link with either friendly stations on earth or other satellite stations.

"Such a device," Baker continued, "might be based upon the unique 'license plate' carried around by every space vehicle—that is, its orbital elements.

"The determination of satellite orbits from satellite observation." Baker added, "offers significant advantages over terrestrial orbit determination."

First, there would be no ionospheric refraction problems. Second, radar frequencies could be chosen that would greatly handicap a terrestrial station from monitoring the active orbit-determination procedure. Third, knowledge could be maintained of launches and space vehicle maneuvers anywhere on earth.

"From this point of view," Baker concluded, "the data collected by these 'space reconnaissance' or 'inspection' satellites could be utilized directly to augment the capability of the National Space Surveillance System as well as provide our satellite systems with an immediate reaction capability."

• • •

Britain's radio and electronic component industry will hold its 17th Radio and Electronic Component Show May 30 to June 2, 1961, at Olympia, London.

Forty-five thousand engineers, technicians and industrialists from all parts of the world have been invited to attend. The exhibits include the latest electronic applications — components for computers, machine tool controls, satellites and missiles.

Tickets are available from the Radio and Electronic Component Manufacturers' Federation, 21 Tothill Street, London, S.W. 1, or at the door. Overseas visitors will be admitted without charge.

The worldwide network of satellite Minitrack stations and the Goddard Space Flight Center of the National Aeronautics and Space Administration were linked together November 22 in a new semi-automatic communication system.

The new system will permit faster, more flexible transmission of information from Minitrack stations and the complex of related scientific and data users associated with the network, to the Space Control Center of NASA. It will make possible the transmission of a larger volume of messages at faster speeds than the previous completely manual system. Messages as well as inter-agency communications will be handled at the rate of 130,000 words per hour by the new system. Any one of the Minitrack stations can either transmit information directly to the center, the NASA computer group and to launching installations, or the switching center can be used as a relay station for messages between the individual stations.

The new communications system, engineered by the Western Union Telegraph Co. to NASA specifications, is being operated by NASA communications personnel on a 24-hour basis. The system is currently being used in tracking the orbits of 7 satellites including Explorer VIII, Tiros I, Echo I, Transit II, Explorer VII, Vanguard I and Tiros II.

• • •

Discovery of a new metallic compound with on-and-off magnetic characteristics was reported by scientists of the Du Pont Company at the sixth annual Conference on Magnetism in New York.

The new material—a brittle, gray manganese compound—becomes magnetic as the temperature rises above a point predetermined by its chemical composition; it becomes non-magnetic when the temperature drops below that point. By slight changes in composition, that point can be varied over a wide range of temperatures. Most magnetic materials normally stay magnetic, their magnetism diminishing gradually as temperature increases until the magnetism finally disappears.

The compound's abrupt magnetic change occurs because the distance between its atoms determines how the inner magnetic forces are lined up. When the distance is less than a specific length, the forces are aligned in a non-magnetic pattern; when it is longer, they swing into a magnetic pattern. The compound contracts and expands as other substances do and its range of contraction includes the

dimension at which the magnetic forces shift. Hence temperature brings about the magnetic change.

Chromium manganese antimonide was the first intermetallic compound found to exhibit the characteristics described. Several others have since been discovered. Manganese antimonide itself is a well-known ferromagnetic substance exhibiting normal properties. Introduction of the chromium in proper quantity produces the unusual properties. The change in the material as the temperature goes below the transition point is an abrupt temperature-induced shift from the ferrimagnetic to the antiferromagnetic state. Experiments to date indicate that it is practical to vary the transition temperature from near absolute zero to over 100°C. Maximum magnetization occurs at or slightly above the transition temperature. A maximum magnetization of about 2000 gauss is typical of samples with transitions that occur in the room-temperature range. As temperature increases above the transition point the material exhibits normal ferrimagnetic behavior, with magnetization decreasing until it disappears at the Curie temperature (250°C in compositions with room-temperature transition). The transition is accomplished without hysteresis.

• • •

Cruisers and destroyers of the U.S. Fleet have been equipped with the first seaborne electronic scanning radar capable of pinpointing simultaneously three essential target dimensions—range, bearing and altitude—to retaliate against enemy airborne attack.

The U. S. Navy and Hughes Aircraft Company announced that Frescan, a powerful, lightweight, all-weather radar, uses only a single antenna, transmitter and receiver and automatically flashes information on supersonic targets to information and control centers which fire interception Talos, Terrier or Tartar missiles. Conventional radar systems, generally require combinations of several antennas, transmitters or receivers to provide three-dimensional target information as well as heavy, mechanical gyro-stabilizing equipment to compensate for pitch and roll of a ship at sea. Frescan does not. Hughes delivered the first prototype 3-D radar equipment to the Bureau of Ships in August, 1957.

The Frescan radar system is an example of joint service cooperation. A direct result of Navy's pioneering effort is Frescanar, a U. S. Army 3-D electronic scanning radar. Frescanar serves as the "eye" of Missile Monitor, the mobile air defense fire distribution system for use with a field army now deployed in Europe.

Ships now equipped with Frescan include the Navy's missile cruisers *USS Galveston*, *Springfield* and *Providence*, the missile destroyer-leader *Dewey* and others.

• • •

The Military Affiliate Radio System marked a dozen years of service to the nation November 26, 1960. During those 12 years, MARS, joint Army-Air Force organization of licensed amateur radio operators, has developed a network of "ham" stations that girds the earth. With a membership of about 15,000, more than 70 percent of whom are civilians, MARS is an ever-ready emergency radio net.

Along with providing emergency communications net, MARS creates interest in military communications and gives training along these lines. Membership is open to all persons, 16 years and older, who hold amateur radio licenses, and have a station in operation capable of operating on at least two MARS frequencies with a frequency accuracy within one-one hundredth of one percent.

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Captain William E. Bettis is Chief of MARS Air Force and Major Sidney Rexford is Chief, MARS Army.

• • •

An extensive American collection of art reflecting the mood of World War II both at home and on the fighting fronts was donated to the Department of Defense by *Life* Magazine at ceremonies in the Pentagon on the anniversary of the attack upon Pearl Harbor, December 7.

Formal presentation of the more than 1,000 paintings, water colors and drawings representing the work of 54 artists was made by Henry R. Luce, Editor-in-Chief, *Time*, Inc. The donation was accepted by Deputy Secretary James H. Douglas.

The collection, whose permanent home is to be the Pentagon, is so large that only one-third can be displayed in the 350 foot long corridor at one time. The works will be exhibited in rotation. The exhibition is open to the public daily between 8:00 A.M. and 6:00 P.M., except Saturdays, Sundays and holidays.

• • •

The U. S. Weather Bureau has put an electronic computer-plotter into operational use that mechanically draws a complete weather map of the Northern Hemisphere in less than three minutes.

The electronic unit, known as the Weather Plotter, reads weather information supplied in numerical form on magnetic tape and presents the information to a digital-to-analog converter. The converter instructs the mechanical "hand" of the plotter to automatically draw contours or isobars, which represent lines of barometric pressure, on a 30-by-30 inch map of the Northern Hemisphere.

The Weather Plotter was developed and produced by Electronic Associates Inc., of Long Branch, N. J. Two such units have been installed at the Weather Bureau's National Meteorological Center, Suitland, Md. Similar units will soon be installed at Pt. Mugu and Monterey, Calif.

Information fed into the Plotter is gathered from more than 500 weather observation stations throughout the Northern Hemisphere. Observations are taken twice daily, at noon and midnight London time, and fed into the Center by teletype. Forecasts, ranging from 12, 24, 48 and 72 hours ahead, are programmed on a computer and recorded on magnetic tape. The tape is then put on the Weather Plotter for reading, conversion and map plotting. Sixty-four weather maps are produced for various altitudes from sea level to 40,000 feet during the course of a 24-hour day. Each map forecasts air flow patterns for a particular forecast period. Maps of these air flow patterns at 40,000 feet and higher are prepared for use by the military and airlines in determining the best flying routes and altitudes for jet aircraft.

Immediately after each map is produced, it is distributed by facsimile to 26 U. S. Weather Bureau stations throughout the U. S. for use in local and regional weather forecasting. Maps also are distributed by the same method to more than 600 military airfields and stations, airlines, universities and commercial weather forecasting operations.

• • •

The "missile bloom" effect, occurring shortly after launch of a ballistic missile, is being studied by The Research Division of Radiation Incorp. in support of the Armed Forces Interservice Radiation Measuring Program (IRMP). Radiation has constructed and is operating a specialized radiation measuring system for the Air Force Missile Test Center, Patrick AFB, Florida. Purpose of the equipment is to obtain spectral and configurational information on the "missile bloom" phenomenon. The current IRM program is concerned with acquiring radiation measurements from the launch phase of ballistic missiles.

The missile bloom effect occurs in conjunction with most nocturnal ballistic missile launchings at an altitude of about 120 kilometers (74½ miles). It appears as a whitish glow surrounding the missile as viewed from the Cape Canaveral, Patrick Air Force Base area, has a rapid growth that persists for many seconds, and has a diameter of several miles.

Equipment consists of a 35mm cine camera with an eight inch focal length, f/3.5 lens to obtain the configuration data. The spectral information is obtained by means of a radiation spectralvisual photometer (RSVP), constructed at the Research Division, and designed for this purpose. The RSVP photometer uses a 5-inch aperture, 24 inch focal length lens and a photomultiplier tube detector. Spectral information is provided by means of a series of interference filters which are mounted on a wheel and rotate in front of the photomultiplier detector. A total of thirteen interference filters is used, providing spectral information from 0.385 to 0.572 microns, with an average bandwidth of .01 microns.

The signal from the photomultiplier tube is amplified and recorded and the whole system is calibrated in radiometric units. Range timing is supplied to both camera and photometer for correlation. Spectral and configuration data are correlated to give an indication of the quality of track and the relation between the spectra and the shape of the bloom.

• • •

A Navy sponsored high speed facsimile system developed by the Hogan Faximile Corporation was demonstrated last November at the Pentagon.

Developed under the sponsorship of the Navy's Bureau of Ships, the new system will transmit microfilmed engineering drawings or printed pages from one point to another, reproduced enlarged on translucent paper at the receiving end at the rate of 26 feet per minute. Blue-prints for a single ship such as an aircraft carrier weigh as much as 300 tons. The new system is expected to overcome a serious distribution problem pertaining to construction diagrams and plans for Navy ships.

The system consists of a Scanner which picks up images from microfilm, and a recorder which receives the images from the Scanner either by coaxial cable or microwave transmission network. The recorder can be situated a considerable distance away from the Scanner. In a practical application, if recorders were situated in shipyards throughout the country, and it was desired to have

those yards all build the same type of ship simultaneously, the engineering drawings for the ships' construction could be transmitted from a single point to any or all of the building yards at the same time. The plans would be reproduced as 18" wide prints at the receiving sites and would be ready for instant use. The system will be capable of transmitting a 480-page book in four minutes, the Navy announced.

The equipment is being evaluated for possible use at 11 naval shipyards and at numerous other activities. If produced in quantity, a Scanner and Recorder together will cost approximately $70,000.

• • •

A customer trial of the world's first electronic telephone central office began in Morris, Illinois, last November by Bell Telephone Laboratories and Illinois Bell Telephone.

Developed by Bell Laboratories, the system performs electronically all the functions in handling of telephone calls. Through the use of tiny gas tubes, a vast memory system, and thousands of transistors and other solid state devices, which operate in millionths of a second, the new system permits Morris trial users to use home extension phones as intercoms, simply by dialing two digits; reach frequently called numbers by dialing only two digits instead of seven; have incoming calls routed to another phone when the originally called line is busy; and, dial a code which causes all subsequent incoming calls to be automatically transferred to any other number. Other services expected to be introduced soon will permit customers to allow a third party to be called into an existing telephone conversation and to have an immediate connection to a busy line as soon as the line becomes available.

The Electronic Central Office (ECO) uses stored program control to perform its job. Each action of the machine is determined by instructions stored in its memory. ECO solves many of its problems by looking up information—2¼ million bits—stored on photographic plates in the machine's memory.

ECO performs its work with speed and has enough time to continually check its own circuits. It locates and diagnoses its own troubles and, in some cases, makes the necessary corrections. If the fault can't be corrected by the machine, it writes what the trouble is in detail on a teletypewriter, adding the month, day, hour and minute of the malfunction. Repairs are then made by the staff.

The Morris ECO uses some 12,000 transistors and 105,000 diodes. Other electronic components are used by the tens of thousands.

• • •

Charles P. Ginsburg of Ampex Corp., who led the development of the Ampex Video-tape television recorder, has received the Valdemar Poulsen Gold Medal from the Danish Academy of Technical Sciences.

Ginsburg is the first native-born American to receive the award, which has been given only six times since its inception in 1939. The Medal was presented to Ginsburg by Carl Schroder of Copenhagen, vice president of the Academy, in special ceremonies in San Francisco.

Ginsburg was cited by the academy for his "guiding spirit and principal participation in the development of the 'video tape' recorder by Ampex Corporation—an outstanding achievement . . . which is well known to magnetic recording and television engineers all over the world."

• • •

A battery-powered and transistorized Telegraph Signal Distortion Measuring Set that measures all types and speeds of ordinary teleprinter signals has been developed by the Atlantic Research Corporation, Alexandria, Virginia. The new set features portability and long life on a single battery.

The Telegraph Signal Measuring Set, designated DMS-1A, measures both mark and space pulses in teletype signals and indicates any distortion. Readings are accurate to ±2% distortion. The instrument will handle neutral and polar loop currents at 60, 75 and 100 words per minute.

• • •

A new, high-speed algebraic compiler—the first operating ALGOL (*Algo*rithmic *L*anguage) program made available by a computer manufacturer—has been announced by Burroughs Corporation.

Devised for the Burroughs 220 electronic data processing system, the compiler accepts a machine-independent, problem-oriented language—permitting scientists and engineers to transmit their problems to the computer in nearly pure algebraic notation.

Besides offering high translation speed—an average of 500 machine-language instructions/minute—the Burroughs Algebraic Compiler provides computer-language programs which are nearly as efficient as labori-

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ously achieved hand-made programs. This compiling speed is made possible by simplified one-pass internal operation. In addition, a one-load "compile-and-go" feature allows for immediate processing of compiled programs, eliminating excessive card handling.

Semi-automatic segmentation permits construction of a program in which the main body of the program becomes a master routine, controlling the operation sequence and memory assignment of program segments. The compiler thus allows the computer to handle programs which exceed the available amount of storage.

Minimum Burroughs 220 system requirements for the compiler include 5,000 words of magnetic core memory; two magnetic tape units; and, a one-input, one-output unit Cardatron subsystem. Built into the compiler are special diagnostic features, which control scanning of the source program for syntactical errors. These are listed without interrupting the compiling process, permitting maximum detection of errors.

Additional symbolic debugging aids provide for the monitoring of the values of variables during the running of the object (machine-language) program. A symbolic memory dump is also available at object time.

• • •

Seventeen Air National Guard communications and electronics installations and maintenance squadrons have been earmarked to assist in developing communications facilities at USAF ballistic missile and test sites throughout the United States during the summer of 1961.

Major General D. W. McGowan, Chief of the Air National Guard Bureau, said that the units include two communications maintenance squadrons and fifteen GEEIA squadrons, the latter taking its name from the Air Materiel Command's Ground Electronics Engineering Installations Agency. The seventeen squadrons will work directly under Air Materiel Command and will perform many types of communications and electronics installation functions needed by the Air Force in its missile and satellite programs.

• • •

Wallson Associates, Inc., Elizabeth, N. J., has developed a dynamic rectifier analyzer that tests semiconductor rectifiers at any combination of ratings from 100 milliamperes to 20 amperes and from 0-1000 volts.

Designated the Wallson Model 170, the self-contained analyzer tests under operating conditions and evaluates heat sink design. It is reported suited for incoming and on-line inspection and laboratory use; test conditions imposed by the Model 170 meet and exceed the proposed JEDEC specifications.

Mirror-scaled 1% meters include: 1/5/25 amp DC full scale to measure average forward current; 250/1000 volts peak to measure reverse voltage; 0-1/5 volts to measure average forward voltage drop. Average reverse current is measured from one microamp to 50 ma in four ranges. Front panel terminals provide direct output for oscilloscope display of forward and reverse characteristics. Power input is 120 volts, 60 cps, 400 watts.

• • •

An electronic switching system that internally routes telegraph messages to their various destinations at the rate of 83,000 words a minute was exhibited recently before the International Air Transport Association meeting at the Waldorf-Astoria Hotel.

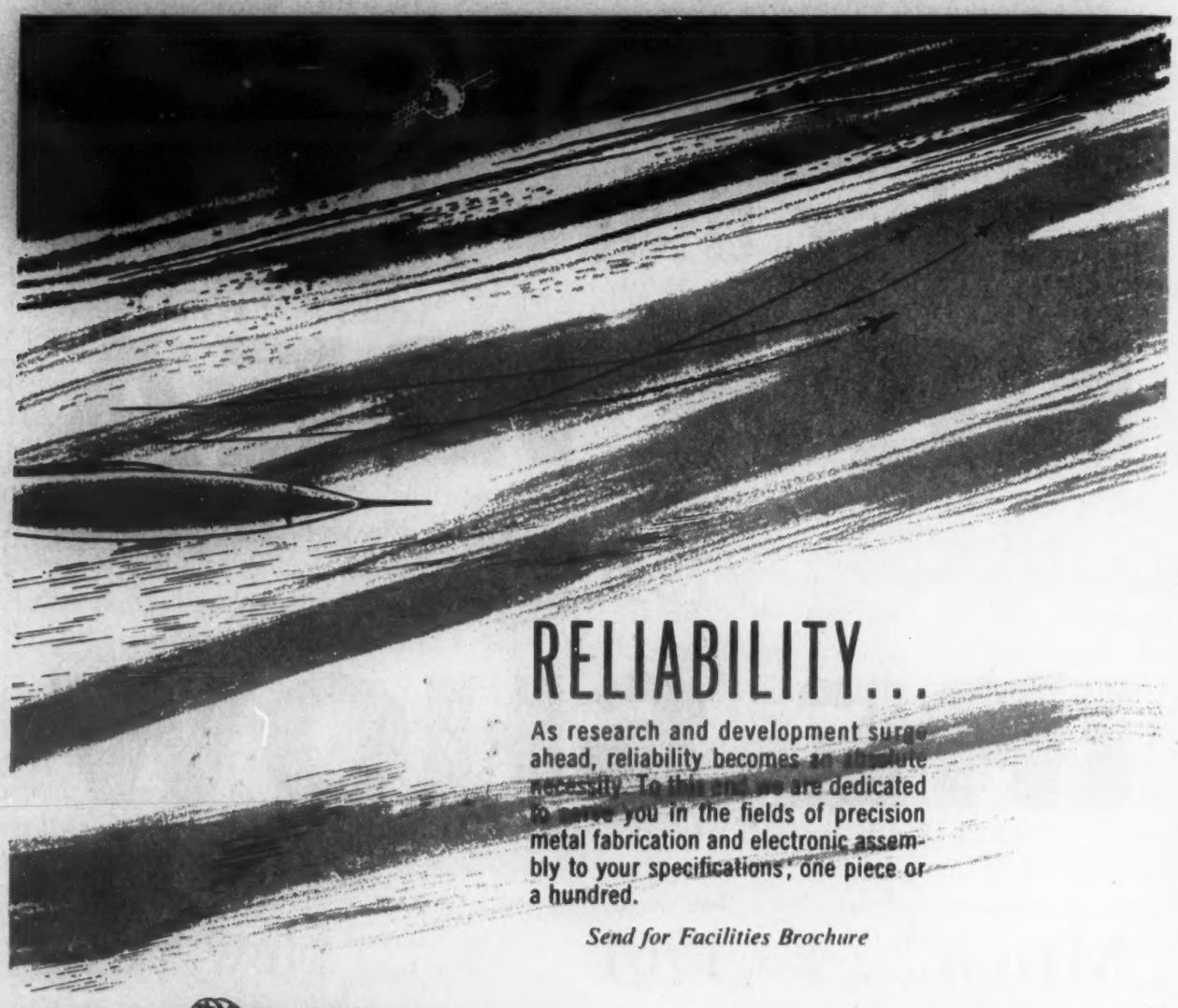
STRAD (*S*ignal *T*ransmission, *R*eception *a*nd *D*istribution) was developed by International Telephone and Telegraph Corporation's British affiliate, Standard Telephones and Cables Ltd., London. The equipment receives telegraph messages from up to 108 incoming circuits, temporarily stores them on a magnetic drum, sorts all messages according to destination and then retransmits them in order of priority and time of arrival to appropriate circuits. The system is fully alarmed so that any faults which occur are automatically localized and parallel operation of main or duplicate common equipment is begun to assure continuity of service.

• • •

A subminiature high voltage DC to DC converter has been developed by Telex, Inc., St. Paul, Minnesota.

Especially designed for infrared detector tube excitation in its initial configuration, modifications of the unit are also available for a variety of input and output voltage combinations, including use with geiger tubes, cathode ray tubes and other applications requiring high voltage and low current. Typical voltages are 12 Kv DC and 16 Kv DC.

The thumb-sized voltage supply operates from a 1.3-volt mercury battery and delivers more than 250 hours' continuous operation on a single 0.8 ampere hour cell. Hermetically sealed with a steel housing, it



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Designed for low noise preamplification in the range of 30 to 500 mc, the Community Engineering Corporation (State College, Penn.) Model 2009 Preamplifier has a noise figure of 2 db at 50 mc, 4 db at 200 mc, and 6 db at 500 mc. Bandwidth can be specified from 10 mc to 25 mc wide. Gain is 20 db to 40 db, depending upon center frequency and bandwidth. The unit is designed for outdoor mounting so that it may be placed adjacent to the antenna terminals. Its integral weatherproof housing is of heavy heliarc welded aluminum with connectors and pilot light mounted on the bottom and surrounded by a drip shield.

The unit is widely used in telemetering applications in the region from 215 to 260 mc. A two-stage grounded grid lumped constant amplifier employs two type GL-6299 planar triodes.

• • •

The American Rocket Society held its 15th Annual Meeting and Astronautical Convention December 5-8. One hundred sixty-five papers were presented in thirty-five sessions that covered all aspects of space technology.

Of particular interest was a paper by Harold Rosen of the Hughes Aircraft Company entitled, *A Commercial Communications Satellite*. Mr. Rosen described an active equatorial repeater satellite. This kind of satellite, while considered to be the best kind of repeater satellite, was heretofore years away because of the technical difficulties involved. The satellite uses a pancake antenna to decrease the complexity of the orientation mechanism while retaining sufficient directivity. This and other simplifications permit a total satellite weight of only 150 pounds including the equipment required to maintain its position and orientation.

The ground terminal proposed for this system would have a fixed antenna illuminated by a movable feed. Mr. Rosen stated that an initial launch could be made next fall if this scheme were implemented.

The Robert H. Goddard Memorial Award, highest honor in the field of rocketry and astronautics, was presented to Dr. Theodore Von Karman, pioneer in aeronautical and astronautical research.

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The following publications translated from foreign technical literature are now available in English translation through the Office of Technical Services, Business and Defense Services Administration, U.S. Department of Commerce, Washington 25, D. C.

Innovations in Communications Technology by Vestnik Svyazi, USSR, 1960 (Order No. 60-21735, 50¢).

Resonance Absorption of Sound in Paramagnetic Materials translated by S. A. Al'tshuler, Akademiya Nauk SSR, Doklady, May 1960 (Order No. 60-21774, 50¢.

Cumulative Probability of Recognizing a Signal on a Radar Set translated by R. Illwitzer, N. M. Sedyakin, Radioteknik, USSR, March 1960 (Order No. 60-21771, 50¢).

Receiver Amplifier Device RDPK-30 S. Segal and L. Koshevoy, Radio Moscow, 1960 (Order No. 60-21740, 50¢).

Electron Microscopes: Selected Translations by V. Vertsner, Akademiya Nauk, May 1960 (Order No. 60-31144, $3).

Bulletin of Stations for Optical Observations of Artificial Earth Satellites Byulleten Stantsiy Opticheskogo Nablyudeniya Iskusstvennykh Suptnikov Zemli, May 1960 (Order No. 60-21608, $1.25).

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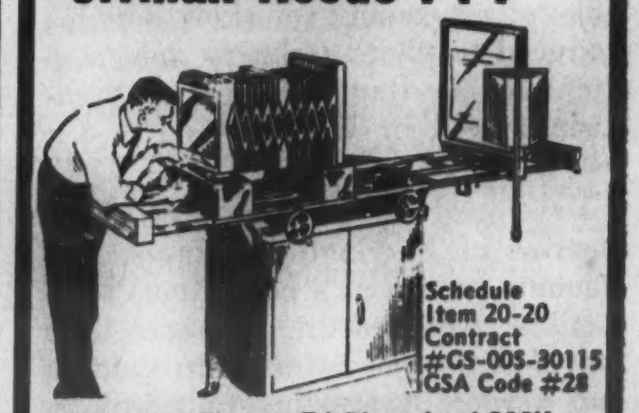

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Photoprogress

The National Aeronautics and Space Administration reports "some indication of improvement" in the quality of cloud cover pictures being transmitted by the wide-angle camera of Tiros II. Early wide-angle camera photos were not of the same good quality of those received from Tiros I.

By noon of November 28, Tiros II had transmitted 998 picture frames to receiving stations at Ft. Monmouth, N. J., and San Nicolas Island, California. Of 312 frames sent from the narrow-angle camera, which scans an area about 75 miles in diameter, 85 percent are "meteorologically useful," NASA said. The wide-angle camera has produced 686 frames. From 5 to 10 percent of these contain useful data, NASA said.

NASA scientists will continue to interrogate the satellite in an effort to find out what is causing the malfunctioning of the wide-angle camera. The narrow-angle camera in Tiros I also worked improperly for a time due to a failure in the timer. This trouble corrected itself after more than a month.

Tiros II's infrared heat-sensing equipment is functioning well, taking measurements of the cloud-top temperatures, the earth's light reflectivity, surface temperatures over cloud-free areas and the heat radiation of the earth and its atmosphere.

• • •

A variable speed camera that will record radar and cathode ray tube impulses and develop the film in the camera in one minute without any tanks of processing solutions, was introduced to photo industry delegates attending the Rapid Processing Symposium held in Washington, D. C., last October.

Developed by Chicago Aerial Industries of Barrington, Illinois, and officially known as a continuous strip oscilloscope recording camera, the unit features a Sonne strip camera and a rapid processing unit for developing the film.

Prototypes of the unit have been in use in Chicago Aerial's quality control operation measuring shutter efficiency and potentiometer balance in CAI photo-reconnaissance systems. Quality control technicians have been able to secure graphic evidence of system performance over a wide range of simulated flight conditions. The new units allow technicians to check a limitless number of electronic functions at selected intervals on a strip of film up to 100 feet in length.

First production models are scheduled to appear in January, 1961.

• • •

Three-dimensional microphotographs are being produced by a 35mm Stereo Graphic Camera developed by Graflex Inc., of Rochester, N. Y. Affixed to a Cycloptic Stereoscopic Microscope (manufactured by American Optical Co.), the Graflex is part of a complete, easy-to-operate inspection system, which also includes a stereo viewer and a mounting bracket for the correcting prism.

Photographing a component is a three-step process: the microscope is adjusted to bring the unit into sharp focus; the Stereo Graphic Camera mounted directly to the Cycloptic Microscope ready for instant use, is then swung into position over the eye pieces. Specially-designed compensating prisms in the adapter make the camera parfocal for use with the microscope's optical system; and the cable release is used to snap the shutter.

To compensate for differences between the eyes, the left eyepiece tube of the Cycloptic Microscope is equipped with a spiral focus collar. After the operator obtains a sharp focus in the right tube, he shifts this eye to the left tube, and again adjusts the collar for sharp focus. By this process the operator can make sure the camera will photograph exactly what he sees.

Brilliant illumination of the subject for the inspection and photography is provided by a self-contained fluorescent light package which is clamped to the objective of the microscope. The lighting system is corrected for color photography.

Names in the News

Col. W. D. Joslin, former Army Signal officer of the Fourth U. S. Army, has been appointed Chief of the Army Communications Systems Division of the Office of the Chief Signal Officer.

Col. John Clapper, Jr., Chief, U. S. Army Radio Frequency Engineering Office, has been awarded the Army Commendation Ribbon with Medal Pendant.

E. A. Freiburger has been appointed government sales manager for Videograph Products, A. B. Dick Company.

Murray G. Crosby, president, Crosby-Teletronics Corp., has been appointed to the government's Patent Advisory Committee.

Charles L. Backus, Jr. has been designated Central Region vice president of Autonetics, a division of North American Aviation, Inc.

Edward J. Whalen has been elected secretary of International Telephone and Telegraph Corporation.

George Voigt has been named to the newly created post of director of government relations for military products for Zenith Radio Corp.

Richard B. Le Vino has been elected vice president of research and engineering of Smith-Corona Marchant, Inc.

Frank W. Godsey, Jr., president of Electronic Communications, Inc., has been named for inclusion in the second and most recently published volume of "American Men of Science."

Robert E. Bell has been named district sales manager, Army Programs, for the General Electric Company's Heavy Military Electronics Department.

William J. Nolan has been promoted to senior vice president in charge of legal affairs of Sprague Electric Company. Other promotions include: **Neal W. Welch** to senior vice president, marketing and sales; **Wilbur A. Lazier** to senior vice president, technical director; **Robert C. Sprague, Jr.** to senior vice president, industrial relations; **David B. Peck** to vice president, special products; **Hollis R. Wagstaff** to vice president, fiscal; **Carroll G. Killen** to vice president, industrial and military sales; **Bruce R. Carlson** to vice president, corporate planning and systems.

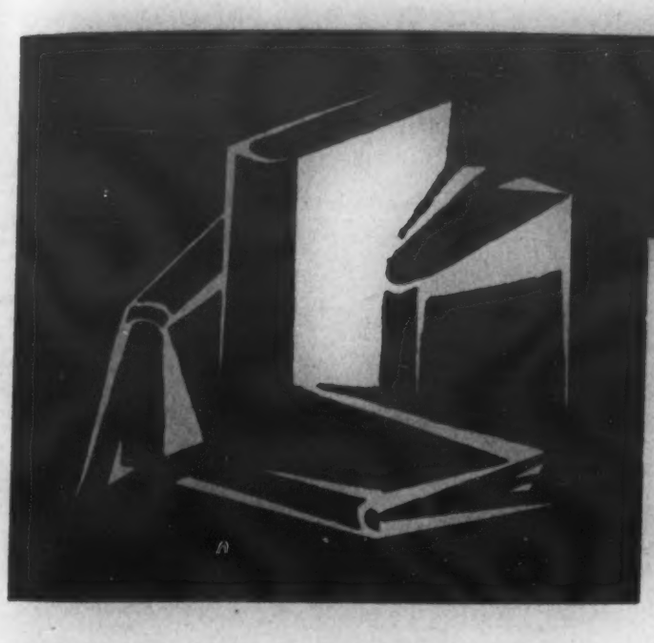
John F. Whitehead is president of Communications Electronics, Inc., a company recently organized in Bethesda, Md. Other officers are: **Ralph E. Grimm**, executive vice president; **Paul R. Mattix, Jr.**, vice president; **Edward M. Gearing**, secretary and treasurer.

F. L. Ankenbrandt has been named manager of defense product assurance for defense electronic products, Radio Corporation of America, Camden, N. J. He is a national director of AFCEA.

Dr. Alexander A. Kiriloff has been named senior microwave research engineer of the Polytechnic Research and Development Electronics, Inc., in Brooklyn, N. Y.

Henry C. Jones, has been elected president and a director of The Electrada Corporation.

Clarence H. Hopper has been named president of CBS Electronics.



Books

INFORMATION PROCESSING, International Documents Service, Columbia University Press, 2960 Broadway, N Y. 21, N. Y., 1960. 600 pages, $25.00.

This comprehensive book contains the proceedings of the international scientific conference on information processing convened by UNESCO last year. Under the Presidency of Dr. Howard H. Aiken of Harvard University, this conference was attended by some 2,000 scientists, technicians and research workers from 39 countries.

This book contains the full text in English and French of each of the sixty-one papers written especially for the conference. Topics cover every major aspect of information processing, including: methods of digital computing, common symbolic language of computers, automatic translation of languages, the logical design of computers, and others. Also presented here are summaries of each paper in English, French, German and Spanish as well as summaries in English and French of the sixty-five lectures given in the course of the various specialized meetings.

Information Processing will be highly useful to university departments of pure science, applied science and engineering as well as for designers and manufacturers of electronic equipment, industrial and commercial concerns and public utilities already using electronic computers.

MANUAL OF PHOTOGRAPHIC INTERPRETATION, published by The American Society of Photogrammetry, 1515 Mass. Ave., N.W., Washington 5, D. C., 1959. 800 pages, $12.00.

This is a comprehensive work describing principles and applications of photo interpretation in the fields of geology, forestry, agriculture, soil science, hydrology, engineering, geography, urban development and several other natural sciences and related fields.

Cross-references between chapters and sections to emphasize the many mutually supporting procedures and techniques for solving specific photo interpretation problems are included. The book contains more than 600 photographic illustrations, many of which are stereoscopic pairs mounted to permit three-dimensional study. Sixteen pages of these are in color to illustrate the advantages and limitations of aerial ektachrome film, negative color film, anscochrome film, and camouflage detection film, as compared with various "black-and-white" films.

HANDBOOK OF LAPLACE TRANSFORMATION—Tables and Examples, by Floyd E. Nixon. Prentice-Hall, Inc., Englewood Cliffs, N. J., 1960. 115 pages, $6.00.

Widespread use of linear differential equations to describe engineering and physical problems has made Laplace transformation techniques an indispensable tool for engineers, mathematicians and physicists.

Section Three presents the derivation of many Laplace transform theorems and is written so that one not exposed to Laplace transform theory can teach himself. Section Five contains numerous examples illustrating how the Laplace transform method is used and Section Six presents a table of Laplace transform pairs coded so the user can find which he wants immediately. Sections are also included on determinants, commonly used identities and root finding methods.

Mr. Nixon is principal scientist with The Martin Company, Orlando, Florida.

OF GARRYOWEN IN GLORY, by Lt. Col. Melbourne C. Chandler, USA. 7th U.S. Cavalry Assoc., P.O. Box 6243, Arlington 6, Va., 1960. 500 pages, $10.50.

This book is the only complete history of the 7th U. S. Cavalry Regiment from its date of organization in 1866 to inactivation in 1957. This history, richly illustrated by over 200 photographs and 21 maps, vividly portrays the Army's part in building and protecting America since the end of the Civil War. Compiled from the official records of the Regiment on file in the National Archives and the Department of the Army, the history is supplemented throughout by personal accounts of actions as told by former members of the Regiment.

The book also contains six Appendixes including a list of all Regimental Commanders (with photographs); the history and origin of the Regimental Song, Insignia and Coat of Arms; Rosters of all participants of the Battle of the Little Big Horn; Extracts of Orders for all unit citations, a list of all Regimental Congressional Medal of Honor winners; a history of the colors and guidons of the Cavalry; many other historical facts about the Cavalry service in general and the 7th Cavalry Regiment in particular.

THE McGRAW-HILL ENCYCLOPEDIA OF SCIENCE AND TECHNOLOGY, McGraw-Hill Book Co., 330 W. 42nd St., N. Y. 36, N. Y., 1960. 15 Volumes, $175.00.

This work, which has taken five years to complete, contains more than 6,000,000 words and approximately 10,000 illustrations. It consists of 7200 articles written by more than 2000 contributors and covers all fields of Life Science, Physical Science, Earth Science and Engineering. Also included are the major applications of these fields in other technologies such as agriculture, forestry, industrial biology, food and so on. The work is thoroughly cross-referenced, contains extensive bibliographies and has an index of more than 100,000 entries.

To keep the set up-to-date, there will be a continuous revision program as well as an annual supplement entitled, *The McGraw-Hill Yearbook of Science and Technology*, the first of which will appear early in 1962.

INTERNATIONAL DICTIONARY OF APPLIED MATHEMATICS, edited by W. F. Freiberger. D. Van Nostrand Co., Inc., 120 Alexander St., Princeton, N. J., 1960. $25.00.

Defined and explained in one comprehensive volume, are the terms and methods of application of mathematics to thirty-two great fields of science and engineering.

Each has been prepared by one or more specialists in a subject-area of applied mathematics. These definitions and descriptions have been chosen to comprise those terms in general use and those methods which have proved of most benefit in practical calculations and analysis.

An important feature of the book is the group of four foreign language indices which list alphabetically the French, German, Russian and Spanish equivalents of the terms defined in the book, accompanied by their English equivalents.

Personnel Available

As a service to AFCEA members, SIGNAL will make space available in this column for those members who are interested in employment in the communications, electronics and photography industries. Any member is entitled to three insertions in the magazine on a space available basis, free of charge. Please limit your notice to 5 lines. In replying, employers are asked to address: Box ....., SIGNAL, 1624 Eye St., N.W., Washington 6, D. C. Letters will be forwarded to the AFCEA member.

MANUFACTURERS' REPRESENTATIVE with record of sales selling components seeks additional quality line on straight commission basis. Box 164.

COMPONENTS ANALYST with experience as USN electronics technician and as military components analyst with civilian firms. Relocating to Los Angeles-San Diego area approximately Feb. 1961. Salary open. Box 165.

SUBCONTRACT BUYER with eight years experience in precision instrument field in New York area seeks position in Southern California or Arizona. Has had experience as contract administrator. Box 166

CONTRACTING OFFICER with eight years experience in government electronics procurement and administration desires position in contract administration or subcontracting. Salary and location open. Box 167

ELECTRONICS GENERAL MANAGER for airborne electronics subsidiary seeks similar position in Los Angeles area with growth company. Presently responsible for marketing, engineering, manufacturing, finance and personnel. Box 168.

Military Positions Available

Government and military agencies are invited to use this column to announce available positions which may be of interest to the readers of SIGNAL.

U. S. ARMY SIGNAL CORPS is seeking officers in the automatic data processing, photographic and television fields. Officer applicants interested in transferring to the Army Signal Corps currently are being sought. Interested officers should write to Personnel and Training Div., Office of the Chief Signal Officer, Army Dept., Wash. 25, D. C.

U. S. AIR FORCE has openings for 24 electronic and 6 electrical engineers at Air Materiel Command installations. Interested persons should write to Headquarters, Air Materiel Command, Attn: MCACE, Wright-Patterson Air Force Base, Ohio.

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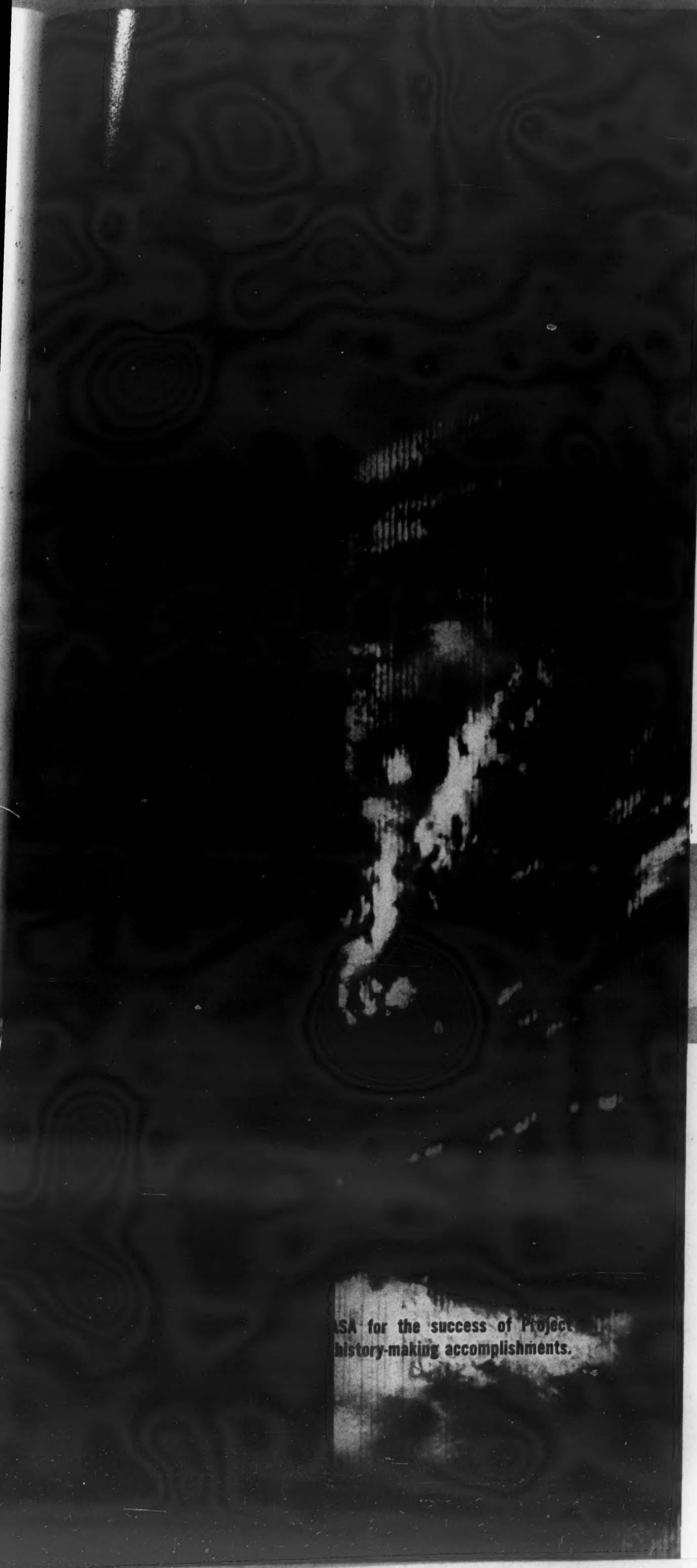

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Tiros II satellite, like Tiros I, was designed, developed and built by RCA's Astro-Electronics Division for the National Aeronautics and Space Administration. It includes all of the equipment of TIROS I—TV cameras, tape recorders, TV transmitters, command receivers, timing mechanisms, beacons and telemetry equipment—plus many new and improved devices. Chief among these are:

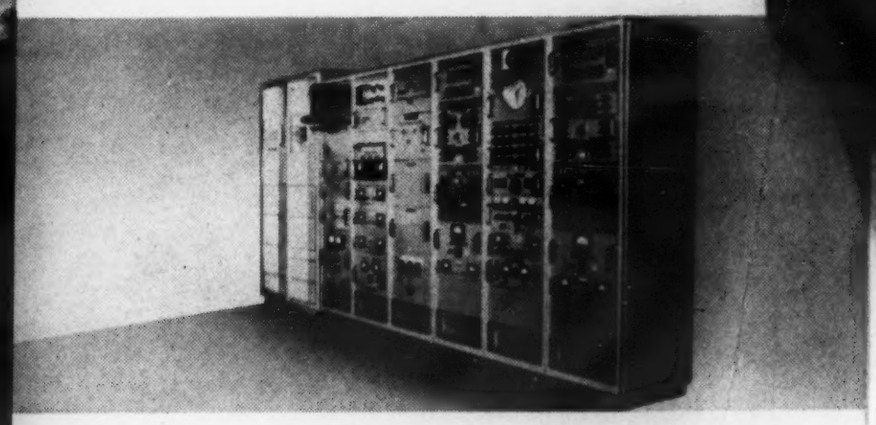
New scanning and non-scanning Infra-Red Sensing Devices—Developed by NASA to measure and record the heat radiation of the earth and its cloud cover adding new dimensions to existing weather data.

New Magnetic Orientation Device—a revolutionary advance to capitalize on the effects of the earth's magnetic field on TIROS II and maintain favorable orientation of the sensors over an extended period of time.

New noise suppressor circuits—to help eliminate extraneous noise from TV pictures TIROS II returns to earth.

New miniaturized RF Diplexer—to provide important savings in payload space and weight.

Improved horizon scanners and sun angle sensors—to give better orientation information for more efficient use of satellite photography and data.



Ground stations for TIROS II were designed and developed by RCA. This includes the primary stations at Fort Monmouth, N. J., at the Pacific Missile Range and the back-up stations at Princeton, N. J. and Cape Canaveral, Florida.

Many of these outstanding improvements were designed, developed, tested and incorporated in TIROS II within the short period of time since TIROS I was launched. It is an example of the kind of dynamic capability that is available to you at RCA's Space Center by simply contacting the Marketing Manager, RCA Astro-Electronics Division, Princeton, N. J.

If you are interested in participating in this challenging team effort, contact the Employment Manager, Astro-Electronics Division, Defense Electronic Products, Princeton, New Jersey.

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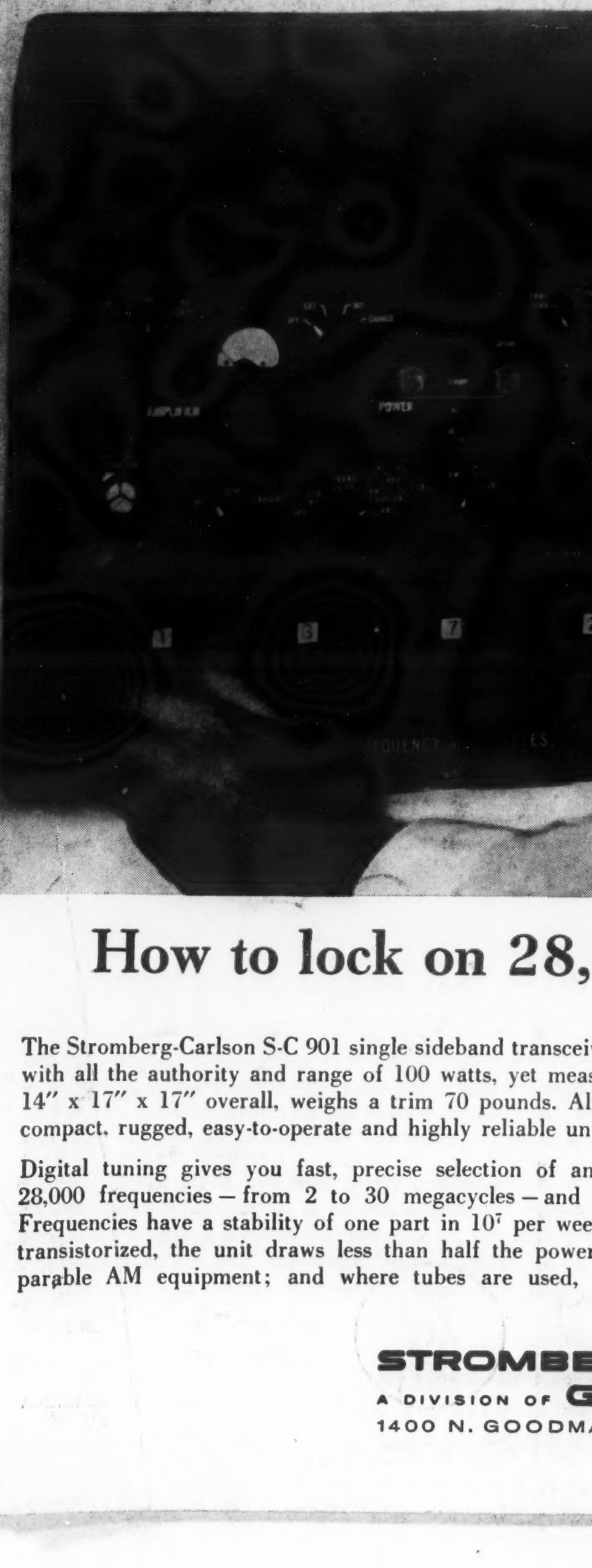

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Engineers and scientists interested in challenging opportunities are invited to send résumés to Director, Technical Employment.

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